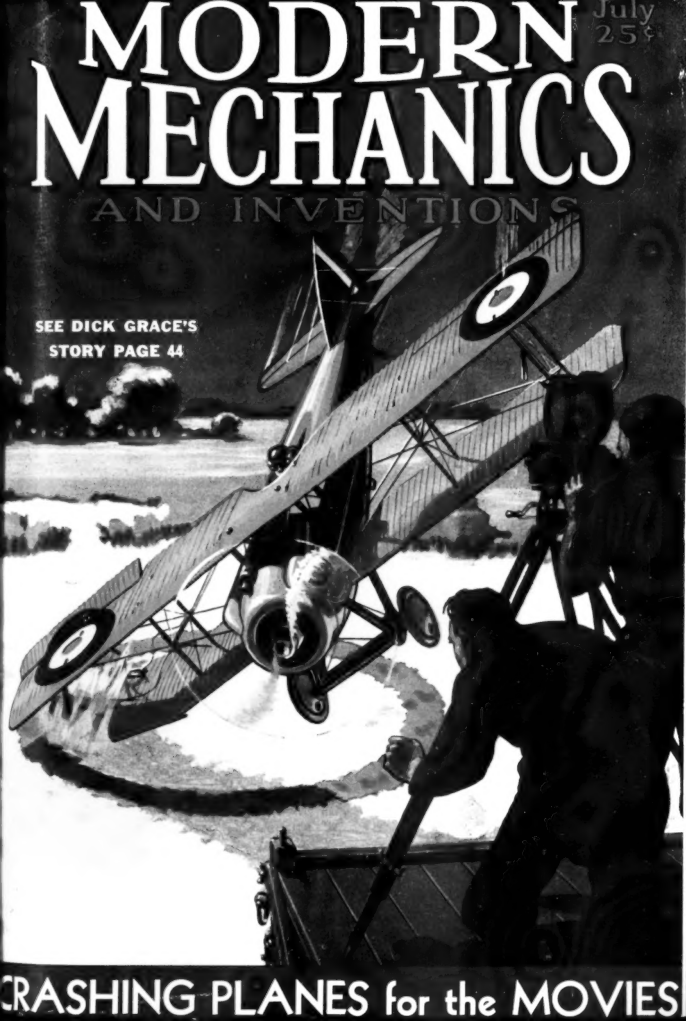
# MODERN MECHANICS AND INVENTIONS

July 25¢



SEE DICK GRACE'S STORY PAGE 44

CRASHING PLANES for the MOVIES

# McSweeny's Amazing New Ways to a BIG PAY Job

Training takes you out of the low pay ordinary jobs. It makes you independent of hard times, strikes, shut downs, because there is always a demand for the trained man. Learn how easily and quickly you can get out of the low pay class by going into Electricity, Automotive or Aviation the McSweeny way.

## ELECTRICITY | AUTOMOTIVE | AVIATION

Learn to control, master and apply this magical juice that rules the universe. Be a McSweeny trained electrical expert.

Every motor propelled vehicle—Automobiles, Trucks, Tractors require constant service. The trained Automotive Mechanic is always in demand.

Learn to master the mechanics of this great new fast growing industry where there is a big need for trained Aviation men.

## You Learn by Doing on Real Equipment in Only 8 to 12 Weeks

The McSweeny Shop Plan is the **PRACTICAL** way to learn Electricity, Automotive or Aviation Mechanics. You learn right here in the McSweeny Shops, on REAL equipment. One entire floor of the school building is devoted entirely to electrical instruction. Another floor is given over entirely to automotive teaching. Here in 8 to 12 weeks you can complete the training in any one of these high pay fields that would take you up to two years by correspondence or through boresome books. You are taught by actual doing—no theory—no guesswork—no puzzling blue-prints. Get out of the rut. Be a McSweeny Trained Man and earn $40 to $150 weekly.

### No Books--No Classes

In the McSweeny Electrical Shops you use real tools instead of books. Your lessons are given on regulation electrical equipment. Here are switch boards, generators, motors. You get first hand knowledge of A.C. and D.C. armature winding, house wiring, splicing, automobile and radio electrical systems and batteries. You are given everything you need to become an electrical expert at big pay. In the automotive and aviation departments are real motors for automobiles, trucks, tractors and airplanes. You work on these motors as well as other parts and learn how to do the right thing in the right way. Expert instructors work shoulder-to-shoulder with you and guide you at every step.

### Guarantee of Satisfaction

You take no risk. I am so positive that you will make a big success after taking my training that I guarantee to train you until you are permanently placed in a good job at good pay. Mail coupon for big FREE Book and remarkable tuition offer if you are over 16 years of age. Act today.

J. H. McSweeny.

**McSWEENY SCHOOLS**
ELECTRICAL
AUTOMOTIVE
AVIATION

**Dept. C-11-G, Chester at 30th St., Cleveland, Ohio**

### Mail This Coupon for FREE Book

J. H. McSweeny, Pres.,
McSWEENY SCHOOLS,
**Dept. C-11-G, Chester at 30th St., Cleveland, Ohio.**

Without cost or obligation, send me your big FREE book and full details of your special tuition offer. (Check school interested in.)

☐ Electrical ☐ Automotive ☐ Aviation

Name .....

Street .....

Town ..... State ..... Age .....

# SUCCESSFUL GRADUATES . . .

## NOW EMPLOYED IN AVIATION

### have built the VON HOFFMANN REPUTATION

The accomplishments of Von Hoffmann graduates now in the industry have made this great school outstanding in aviation. Many of them have now risen to positions of importance, and are calling for men with Von Hoffmann training. They know better than anyone else the calibre and ability of Von Hoffmann graduates—the finest type of pilots and mechanics—men who succeed in aviation because the training they received was beyond government requirements. Thorough instruction and practical training on a variety of late types of Government Licensed modern aircraft, open and cabin, is the reason Von Hoffmann graduates are filling responsible positions throughout the industry—piloting ships, building, repairing and testing them.

Our courses cover actual flying, theoretical instruction, aero navigation, airplane instruments and practical shop training in airplane structure and repair of various type planes—motor construction, adjustment and repair of different type motors including both water and air cooled. A Government rated school located on a $2,000,000 airport. Reasonable prices and a liberal time payment plan. Make your start in aviation—mail the coupon now.

**VON HOFFMANN AIRCRAFT SCHOOL**
**231 Lambert-St. Louis Airport**
**St. Louis, Missouri**

**VON HOFFMANN AIRCRAFT SCHOOL**
231 Lambert-St. Louis Flying Field,
St. Louis, Mo.—MAIL TODAY.

Name .....
Address .....
City ..... State .....
Age ..... I am interested in
☐ Flying Course ☐ Mechanics Course
☐ Welding Course ☐ Home Study

Vol. IV -- No. 3

A FAWCETT MAGAZINE

Other Fawcett magazines are Screen Play Secrets, Triple-X, Battle Stories, Startling Detective Adventures and True Confessions.

# MODERN MECHANICS AND INVENTIONS

JULY, 1930

PRICE 25 CENTS

This magazine is not connected with or associated with any other magazine of a scientific or mechanical nature.

# TABLE OF CONTENTS FOR JULY

## *Special Features*

Crashing Planes for the Movies - - - 44
By Dick Grace, Famous Movie Stunt Flyer

The Mechanics of Baseball - - - 54
By Babe Ruth

Across the Continent in a Glider - - 62
By Capt. Frank M. Hawks
Who was towed across country in a glider

The Story of the Match—a Great World Industry - - - - - - - 68
By Beverly Barnes

Building America's Largest Plane - - 80
As told by Alfred W. Lawson to Alfred Albelli

Pointers for the Angler - - - - 86
By Earle W. Gage

Miracles of Mechanics - 108

Experiments with Air Currents - - - 116
By C. Francis Jenkins
Inventor of the Movie Projector

How Your Senses Fool You - - - - 166
By Sam Brown

## *Interesting Shorter Articles*

Battling a Billion Enemies - - - - 60

The Spider—Master Engineer - - - 74

Postal Flyers Succeed in Bringing Mail Through - - - - - - - 112

Pulling the Teeth of the Mississippi - 120

Novel Ideas Keep Pace with Aviation's Advance - - - - - - - 172

## *Four Great "How-to-Build" Articles*

Build Your Own Garage-Workshop - - 94
By Jay Earle Miller

How to Build "Sez You!" - - - - 132
By Weston Farmer, Naval Architect

**GLANCING AHEAD AT THE AUGUST ISSUE**

**A few of the good things you will find in the August Modern Mechanics, on sale July First: Bigger and Better Iron Horses—the story of new giant locomotives; Mechanical Secrets of Golf; Smoke, the Modern Armor; latest news of aviation's progress throughout the world; scores of pages of plans for building boats, radios, airplanes, auto racers, and smaller projects. Place your order now!**

Outboard Motor Car Does 40 Miles an Hour - 144
By Dick Cole

Plans for Building the Driggs Dart - - 156
By Ivan Driggs

*(Turn to page 6 for a further listing of contents)*

## *Edited by Experts*

Listed below are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers concerning their departments. Address them in care of this magazine, Robbinsdale, Minnesota.

**Major H. H. Arnold**
Former Assistant Chief, U. S. Air Service

**Pilot Gene Shank**
Famous Aviator, Holder of Light Plane Endurance Flight Record

**Weston Farmer**
Naval Architect and Light Plane Designer

**Ivan Driggs**
Noted Light Airplane Designer

**A. Neely Hall**
Author of "The Boy Craftsman," etc.

**L. B. Robbins**
Nationally Known Radio Expert

**Ray F. Kuns**
Principal, Cincinnati Automotive Trade School

**Percival Marshall**
Foremost Exponent of Model Making in Great Britain

**Philip L. Rhodes**
Naval Architect

**Charles Hall**
Former Editor of "Motor Boat"

**Jay Earle Miller**
Associate Editor and Chicago Correspondent

**Donald G. Cooley**
**Bob Gordon**
**J. Russell Dye**
Associate Editors

Published monthly by Fawcett Publications, Inc., at 501 7th Ave. So., Minneapolis, Minnesota. MODERN MECHANICS AND INVENTIONS entered as second class matter September 20th, 1929, at the Post Office, Minneapolis, Minnesota, under the act of March 3rd, 1879. W. H. Fawcett, Publisher; Roscoe Fawcett, Managing Editor; Jack Smalley, Assistant Managing Editor. Copyright 1930. Ray Ryan, Advertising Manager: Chicago office, 35 East Wacker Drive (Phone State 2955); New York office, 52 Vanderbilt Avenue, Room 606 (Phone Vanderbilt 8460). All manuscripts should be addressed to our editorial office at Robbinsdale, Minn. Manuscripts will not be returned unless accompanied by return postage. Advertising forms close on the 20th of the third preceding month. Price 25 cents a copy; $2.50 a year in the United States and possessions. Other Postal Unions, $3.00 per year. Printed in U. S. A.

# ...Raised His Pay $4800* After Reading This Amazing Book Which Is Now *FREE!*

*Based on the combined experiences of F. B. Englehardt, Chattanooga, Tenn., A. F. Thompson, Sioux City, Iowa, L. D. Mathers, of E. Cleveland, Ohio, and many others.

## Caught in a Rut

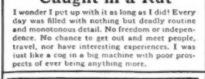
I wonder I got up with it as long as I did! Every day was filled with nothing but deadly routine and monotonous detail. No freedom or independence. No chance to get out and meet people, travel, nor have interesting experiences. I was just like a cog in a big machine with poor prospects of ever being anything more.

## Long, Tiresome Hours

Every hour of the day I was under somebody's supervision. The TIME-CLOCK constantly laid in wait for me—a monument to unfulfilled hopes and dying ambition. Four times a day, promptly or the dot, it hurled its silent challenge at my self-respect, reminding me how unimportant I was and how little I really COUNTED in the business and social world!

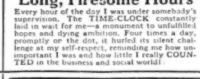
## Low Pay

Paid just enough to keep going—but never enough to enjoy any of the GOOD things of life every man DESERVES for his family and himself. Always economizing and pinching pennies. Always wondering what I would do if I were laid off or lost my job. Always uncertain and apprehensive of the future.



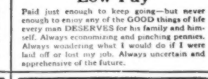
## Desperate

Happened to get a look at the payroll one day and was astonished to see what big salaries went to the sales force. Found that salesman Brown made $200 a week—and Jenkins $275! Would have given my right arm to make money that fast, but never dreamed I had any "gift" for salesmanship.



## A Ray of Light

Stumbled across an article on salesmanship in a magazine that evening. Was surprised to discover that salesmen were made and not "born" as I had foolishly believed. Read about a former coupon-clicker, Wm. Moore of California, making $525 in one week after learning the ins-and-outs of scientific salesmanship. Decided that if HE could do it, so could I!



## The Turning Point

My first step was to write for a certain little book which a famous business genius has called "The MOST AMAZING BOOK EVER PRINTED". It wasn't a very *big* book, but it certainly opened my eyes to things I had never *dreamed* of—and proved the turning point of my entire career!

## What I Discovered

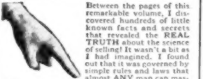
Between the pages of this remarkable volume, I discovered hundreds of little known facts and secrets that revealed the REAL TRUTH about the science of selling! It wasn't a bit as I had imagined. I found out that it was governed by simple rules and laws that almost ANY man can master as easily as he learned the alphabet. I even learned how to go about getting into this "highest paid of all professions". I found out exactly how Mark Barchievich of San Francisco was enabled to quit his $8 a week job as a restaurant-worker and start making $125 a week as a salesman; and how C. W. Birmingham of Dayton, Ohio, jumped from $15 a week to $7500 a year—these and *hundreds* of others! It certainly was a revelation!

## FREE Employment Service

Furthermore, I discovered that the National Salesmen's Training Association, which published the book, also operates a most effective employment service! Last year they received requests from all over the U. S. and Canada for more than 50,000 salesmen trained by their method. This service is FREE to both members and employers and thousands have secured positions this way!

## Making Good At Last!

It didn't take me long to decide to cast my lot with N. S. T. A.—and after a few weeks I had mastered the secrets of Modern Salesmanship during spare time, without losing a day or a dollar from my old job. When I was ready, the Employment Manager found me over a dozen good openings to choose from—and I selected one which paid me over $70 a week to start!



## Was It Worth It?

Today *my* salary is $4800 greater than ever before! No more punching time-clocks or worrying over dimes and quarters! NOW my services are in REAL DEMAND with bigger prospects for the future than I ever dared HOPE for back in those days when I was just another "name" on a pay-roll!

Get Your Copy FREE. Right now the book—"The Key to Master Salesmanship" which banished all my fears and troubles and showed me how to get started on the road to success and independence—will be mailed as a gift to any ambitious man, absolutely FREE. And since there is no obligation, why not see for yourself what amazing facts it contains! Just mail the coupon now—for there is no better way in the world to invest a 2-cent stamp—I KNOW!

NATIONAL SALESMEN'S TRAINING ASSN.,
Dept. H-703, N. S. T. A. Bldg., Chicago, Ill.

**National Salesmen's Training Assn., Dept. H-703, N. S. T. A. Bldg., Chicago, Ill.**

Without obligation, please send me a free copy of "The Key to Master Salesmanship," and other details of N. S. T. A. service.

Name ..... Address .....

Town ..... State .....

Age ..... Occupation .....

## Aviation


Lindberghs Set Cross-Country Flight Record - 50
New Diesel Air Motor Cuts Fire Hazards - 53
American to Pilot Dornier DOX - - 59
Air Buoy Marks Location of Field - - 67
Learn to Fly Free! - - - - - - 76
Device Helps Pilot Judge Wind Direction - 89
Chicago to Have Most Powerful Air Beacon 90
Plane Talk Department - - - - 98
Edited by Major H. H. Arnold
Double-Deck Airplane Ambulance - - 99
Wind Tunnel Tests Plane Performance - 101
Ice Warning Indicator for Airplanes - 137
Italy Builds Largest Military Airplane - 162
Recorder Charts Hours Plane Is in Air - 165
Safer Landings With Caterpillar Wheels - 169


## For the Motorist


Bank Window Built in Street for Motorists 72
Handy Kinks for the Summer Motorist - 130
Motor Mechanics Department - - - 152
Edited by Ray F. Kuns
Making Repairs of Broken Fuel Lines - 152
Lever Removes Stubborn Lamp Rims - 153
Removing Door Squeaks - - - - 153
Sleeping Cot for Use Inside Car - - 154
Car Top Serves as Rear Seat Windshield - 155
Device Prevents Cars Backing Down Hill - 177


## For Craftsmen, Young and Old


Make Your Own Fourth of July Fireworks 110
Home Workshop - - - - - - 138
Edited by A. Neely Hall
Drinking Fountain for Your Shop - - 138
Workbench and Storage Cabinet - - 139
Entrance Arch for the Garden - - - 140
Amateur Electrician - - - - - - 148
Clock Strikes Hours Throughout House - 148
Interesting Experiments With Magnetism - 149
A Simple Lightning Machine - - - 150
By Theodore Allen
Inflating Balloons With City Gas - - 170
Model Cruiser Run by Flashlight Batteries - 174
A Simply Made Garden Barrow - - 180
By Hi Sibley


## Handikinks


Alarm Clock Turns Self Off - - 102
Rubber Chain for Phone Extension Cord - 102
Steps for the Lake Cabin - - - - 102
Cushion Door Bumper - - - - 103
Door Bolt Secures Ladder - - - 103
Door Stop Is Automatic - - - - 103
Loosening Glass Bottle Stoppers - - 103
Corn Popper Cleans Berries - - - 103
Locking Device Prevents Nut Working Loose - - - - - - - 104
Punch Marks Cotter Key Holes - - 104
Auto Piston Makes Cigarette Holder - 104
Fireproof Shop Refuse Box - - - 104
Plastic Wood Makes File Handle - - 104
Build Yourself This Aquaplane - - 105
Spring Clip Prevents Propeller Loss - 105
Campstove Oven Made From Oil Can - 105
Fishline Reel From Saw Handle - - 105
Hollow Surf Board Supports Swimmer - 106
Jig Saw Is Valuable Shop Tool - - 107


## To Interest the Radio Fan


A Pygmy Short-Wave Transmitter - - 122
By L. B. Robbins
Sparks From the Radio Editor - - - 126
You Can Log Every Radio Station in North America - - - - - 126
Make Your Own Wiring Terminals - - 127
Testing Soldered Joint Losses - - - 127
Check Condition of Lightning Arrester - 128
Trailing Antenna Solves Radio Problem - 129


## Items for the Household


Child's Table Converts Into Desk - - 58
Portable Folding Crib Keeps Baby Comfortable - - - - - 66
Household Tasks Made Lighter - - 92
Stainless Steel Safety Razor - - - 163
Automatic Cradle Rocks Itself - - - 164
Grapefruit Shield Saves Eyes - - - 164
Vacuum Cleaner for Garage Use - - 178



The Shop Mail Box will be found this month on page 24


## New Mechanical Inventions


Light Beam Prevents Prison Escapes - - 51
Checkered Board Teaches Dance Steps - 52
Tonoscope Registers Voice Quality - - 52
Side-Car Attachment for Kiddie-Kar - 58
Diminutive Super-Ear for Deaf - - - 58
Oxygen Tent Aids Pneumonia Fight - - 66
Electric Fence Warns of Avalanches - 79
Motor No Taller Than House Fly - - 85
Stop-Light Indicates End of Typewriter Line 89
Talkie Projector for the Home - - - 114
Compact Ratchet Screwdriver Set - - 115
Portable Fire Engine - - - - - 115
Up or Down by Belt - - - - - 136
Makes Lock Chain Easy to Handle - - 137
Handy Tools for the Modern Mechanic - 142
Latest Equipment for Fighting Forest Fires 147
Heel-Protector Saves Golfing Greens - - 163
Tool Holds and Releases Screw - - - 164
Rubber Mat Catches Gold - - - - 177
Self-Launching Emergency Ship Section - 178
Camera Photographs Earth Strata - - 179

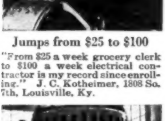

## Interesting Items


Engineers Model City of Montreal - - 59
Coin Holder From Envelope Corner - - 72
Filmador Preserves Movie Films - - - 78
Gar Wood Seeks Boat Speed Record - - 84
Family Silhouettes Make Individual Signpost 85
Pencil in a Miniature Bottle - - - 85
Lipton Challenges America's Cup - - 91
Hunter's Life-Preserver Sweater - - 114
Explaining the Mexican Jumping Bean - 115
Outboard Racer Wins Weight in Trophies - 163
Mammoth Playing Cards for Beach Use - 165
Cleated Ladder Strengthens Feet - - 178


**Cover Design Painted in Oils by Stewart Rouse, Illustrating "Crashing Planes to Order"**

# Who Else Wants a BIG PAY JOB in ELECTRICITY?

Thousands of Cooke Trained Electrical Men are making $3,000 to $5,000 a year — $60 to $100 a week — some even more. They prepared for their fine jobs in **spare time only.** Now look at them — Big Pay Men, successful, independent, on the road to fortune. Who else wants quick success — who else wants Big Money in Electricity — who else wants to quickly say goodby forever to hard work and small pay? Do YOU? Then act at once — mail the coupon today sure!



**Jumps from $25 to $100**

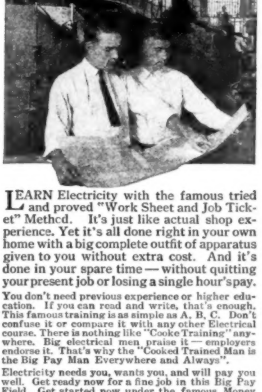
"From $25 a week grocery clerk to $100 a week electrical contractor is my record since enrolling." J. C. Kotheimer, 1808 So. 7th, Louisville, Ky.

**Hubert Gets $100 a Week**

"I was a $30 a week truck driver when I enrolled with you. Now I average $90 to $100 a week easy." C. H. Hubert, 460 Cherry St., New York.

**Now Makes $12 a Day**

"A short time ago when I enrolled, I was a laborer at small pay. Now I make $12 a day." Robert Korns, 203 S. Maple, Newkirk, Oklahoma.



LEARN Electricity with the famous tried and proved "Work Sheet and Job Ticket" Method. It's just like actual shop experience. Yet it's all done right in your own home with a big complete outfit of apparatus given to you without extra cost. And it's done in your spare time — without quitting your present job or losing a single hour's pay.

You don't need previous experience or higher education. If you can read and write, that's enough. This famous training is as simple as A, B, C. Don't confuse it or compare it with any other Electrical course. There is nothing like "Cooke Training" anywhere. Big electrical men praise it — employers endorse it. That's why the "Cooked Trained Man is the Big Pay Man Everywhere and Always".

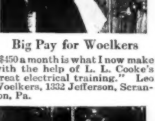
Electricity needs you, wants you, and will pay you well. Get ready now for a fine job in this Big Pay Field. Get started now under the famous Money Back Agreement with the same methods that have put thousands of men no smarter than you on Easy Street. Act today to get Big Pay.

Mail coupon for Big FREE BOOK "The Secrets of Success in Electricity", a brilliant story of Opportunity for you. Get it—mail the coupon NOW.

## L. L. COOKE SCHOOL OF ELECTRICITY

*The Cooke Trained Man is the Big Pay Man*

Dept. 68B, 2150 Lawrence Ave., Chicago, Ill.

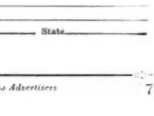


**Big Pay for Woelkers**

"$450 a month is what I now make with the help of L. L. Cooke's great electrical training." Leo Woelkers, 1352 Jefferson, Scranton, Pa.

**Own Shop Pays Big Money**

"You taught me all I know about Electricity. Last month I made $675 in my new shop — I used to get $15 a week." J. E. Ritch, Rt. No. 3, High Point, N. C.



**$80 a Month Increase**

"In five months I boosted my earnings by over $80 a month. I am $1000 a year better off by taking your Course." Martin Herman, Box 598, Drumheller, Alta, Canada.



### The MAN WITH 50,000 FRIENDS

This is L. L. Cooke, the man with 50,000 friends, because he has been so successful in training men for Big Pay Jobs in Electricity. In all the world there's no training like his. That's why his "boys" get the Big Jobs and Big Money. And now he wants to train YOU for a Big Pay Job too. Find out what he can do for you. Mail the coupon for his great book today.

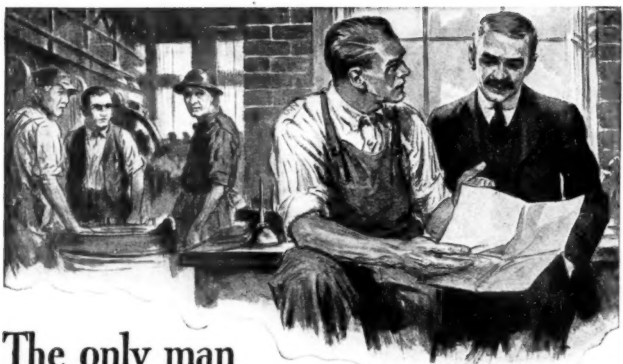
L. L. COOKE SCHOOL OF ELECTRICITY,
Dept. 68B, 2150 Lawrence Ave., Chicago, Illinois.

You may send me, FREE and fully prepaid, your book "Secrets of Success in Electricity," with all particulars about your Home Study Course in Electricity.

Name _____

Address _____

City _____ State _____



# The only man who could talk to the Superintendent

FOR several years, he was just like a score of other men in the plant—a good, honest, fairly capable worker, but only that. There was nothing distinctive about him or his ability—nothing to make him stand out from the crowd—no reason, as a matter of fact, why he should ever receive a raise in salary.

Then one fortunate day he decided that the reason he wasn't getting anywhere was because he lacked special training. He searched around a bit—asked a great many questions—and then enrolled for a home-study course with the International Correspondence Schools.

"Soon after I began studying," he wrote to us the other day, "we had a change in management at our plant. The new superintendent said that only men who had really studied their work were in line for positions as foremen.

"I certainly was glad then that I had decided to study in my spare time. For, thanks to my I. C. S. course, I was the only man in the organization who could talk to the superintendent in his own language. As a result, I was promoted over men who had been here from ten to twenty years. My salary has been increased 90% in the last ten months."

THAT'S a true story of what just one I. C. S. student has done. There are thousands of others. Every mail brings letters from men and women telling of promotions and increases in salary due directly to spare-time study.

What are *you* doing with the hours after supper? Can you afford to let them slip by unimproved when you can easily make them mean so much?

One hour a day, spent with the I. C. S. in the quiet of your own home, will prepare you for success in the work you like best. *Yes, it will!* Put it up to us to prove it. Mail this coupon to-day.

**INTERNATIONAL CORRESPONDENCE SCHOOLS**
*"The Universal University"*
**Box 2324-E, Scranton, Penna.**

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject before which I have marked X in the list below:

**TECHNICAL AND INDUSTRIAL COURSES**

| | |
|---|---|
| ☐ Electrical Engineering | ☐ Lighting |
| ☐ Machinist | ☐ Toolmaker |
| ☐ Patternmaker | ☐ Automobiles |
| ☐ Reading Shop Blueprints | |
| ☐ R. R. Section Foreman | |
| ☐ R. R. Bridge and Building Foreman | |
| ☐ Gas Engines | ☐ Diesel Engines |
| ☐ Aviation Engines | |
| ☐ Highway Engineering | |
| ☐ Civil Engineer | ☐ Coal Mining |
| ☐ Surveying and Mapping | |
| ☐ Plumbing | ☐ Steam Fitting |
| ☐ Heating | ☐ Ventilation |
| ☐ Architect | ☐ Draftsman |
| ☐ Architects' Blueprints | |
| ☐ Contractor and Builder | |
| ☐ Architectural Draftsman | |
| ☐ Structural Draftsman | |
| ☐ Concrete Construction | |
| ☐ Engineering | |
| ☐ Mechanical Engineer | |
| ☐ Steam Engineering | |
| ☐ Structural Engineer | |
| ☐ Chemistry | ☐ Pharmacy |
| ☐ Agriculture | ☐ Poultry |
| ☐ Navigation | ☐ Radio |

**BUSINESS TRAINING COURSES**

| | |
|---|---|
| ☐ Business Management | ☐ Advertising |
| ☐ Industrial Management | ☐ Salesmanship ☐ Signs |
| ☐ Personnel Management | ☐ Lettering Show Cards |
| ☐ Traffic Management | ☐ Stenography and Typing |
| ☐ Accountancy | ☐ Civil Service ☐ Mail Carrier |
| ☐ Cost Accounting | ☐ Railway Mail Clerk |
| ☐ C. P. Accountant | ☐ Grade School Subjects |
| ☐ Secretarial Work | ☐ High School Subjects |
| ☐ Business Correspondence | ☐ Illustrating ☐ Cartooning |
| ☐ Spanish ☐ French | ☐ Designing |

Name.....

Street Address.....

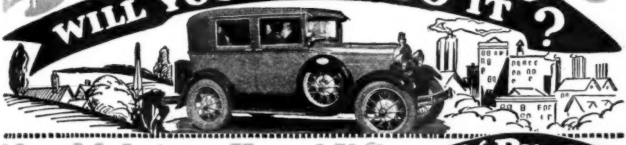
City..... State.....

Occupation.....

*Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada*

# 42 Miles on 1 Gallon of GAS

## WILL YOUR CAR DO IT?



## New Moisture Humidifier & Carbon Eliminator

*for all Makes of Cars, Trucks, Tractors and Engines*

An amazing Scientific Humidifier has been patented throughout the World that beats any ever got out. It makes engines run ALL THE TIME with the same wonderful efficiency they do on a cool moist night. It gives MORE pep and power, HIGHER top speed, eliminates hard carbon, and gives AMAZING mileage. Fords report 28 to 42 miles per gallon. Other makes (both American and Foreign) report marvelous increases of ¼ to double mileage. Some of the best records are:

| | Miles | | Miles | | Miles | | Miles |
|---|---|---|---|---|---|---|---|
| Buick | 28¼ | Ford (Model T) | 42 | Oakland | 31 | Pierce Arrow | 22 |
| Cadillac | 21½ | Ford (Model A) | 40 | Oldsmobile | 34½ | Pontiac | 31 |
| Chevrolet | 41 | Hudson | 23½ | Overland | 41 | Reo | 26½ |
| Chrysler | 30¾ | Hupmobile | 24½ | Packard | 21½ | Star | 41¾ |
| Dodge | 31½ | Marmon | 21½ | Plymouth | 29 | Studebaker | 29 |
| Essex | 32 | Nash | 30 | Graham-Paige | 23½ | Willys-Knight | 29 |

**And Hundreds of Other Wonderful Records on ALL American and Foreign Makes**

## Big Profits

to

**Man with Car**
**Spare or Full Time**

$350 to $1500 a month

**1 man $4,939.66 in 3¾ months Another $1,656.60 in 58 days $5,150.00 in 5 months to another. BIG MONEY can be—IS being made**

**Fitting Motors With Vix**

One man sold 8 first morning. Another sells all 3 men can install.

Another's profits as high as $100.00 a day.

VIX sells itself by 8 STARTLING demonstrations—BIG, STUNNING, ASTOUNDING, DEMONSTRATIONS. Successful VIX men make MORE MONEY than they ever made before.

## Free Trial TRY This New Principle Gas Saver AT MY RISK

Try this wonderful VIX Moisture Humidifier and Carbon Eliminator AT MY RISK on YOUR OWN CAR to prove that VAPOR MOISTURE (drawn from Radiator to Engine) gives you that wonderful night driving effect ALL THE TIME with MORE mileage from gas and oil—eliminates hard carbon accumulation—gives MORE power, a SNAPPIER, PEPPIER motor, FASTER acceleration, a SMOOTHER, QUIETER running engine and HIGHER top speed.

VIX will PROVE ITS MONEY SAVING MERIT on your own car by 8 DEMONSTRATIONS—conducted by yourself AT MY RISK—the most SENSATIONAL, most ASTOUNDING, most CONVINCING DEMONSTRATIONS you ever saw. If you don't find from your tests that it does MORE than I claim; return it and it COSTS YOU NOTHING. **I want wide-awake hustling, County, State, Province and National Agencies everywhere, part or full time, to make $350 to $1500 per month filling the great DEMAND for this wonderful invention wherever introduced. Write for my FREE TRIAL and MONEY MAKING OFFER. Use coupon below.**

**WALTER CRITCHLOW**
**Inventor and Manufacturer, 803-G Street, WHEATON, ILL., U. S. A.**

Pictures here and at top show Model "B" VIX attached to my own New Model A Ford. This car is wonderfully improved in performance with the VIX Moisture Humidifier. So is every Auto, Truck, Tractor, Taxi, Bus, Marine, Stationary and Aircraft Engine, both American and all Foreign makes.

## FREE VIX offer Mail Now

**WALTER CRITCHLOW,**
**INVENTOR and MANUFACTURER,**
**803-G Street, Wheaton, Ill., U. S. A.**

Please send me without obligation or charge your FREE TRIAL and MONEY MAKING VIX OFFER.

Name.....

Address.....

Town..... State.....

**GUARANTEED TO SAVE** { 1/4 to 1/2 Gas, Carbon Cleaning, Engine Repairs

**or Costs You Nothing**

# Slep into BIG PAY this New Way through DRAFTING

COME on you fellows who are sick and tired of lay-offs, job hunting and poor pay work. Say goodbye forever to hard times and starvation wages. Become an Engineering Draftsman and land a fine paying, year 'round job through the now famous L. L. COOKE "See it — Do it" Method — the amazingly simple quick-action Training that's getting sensational results for men like you everywhere. It's new, it's thorough, it's complete — said to be the first real improvement in Drafting instruction in 30 years — and you don't have to be a High School graduate nor a master of figures to learn it and learn it right.

## Only Spare Time At Home Needed — Complete Drawing Outfit Furnished

Just give a little of your spare time to this wonderful training and you'll be surprised how rapidly you make progress. With this amazing "See it — Do it" Method and the Big Complete Drawing Outfit that comes with it you start at once to do Drafting just as it's done in the great Drafting Rooms everywhere — you begin immediately to get the knowledge and the skill that employers demand and pay Big Money for — your advancement is fast and steady — and almost before you realize it you're ready for a fine job in work that pays $50 to $100 a week and more.

## SIMPLE THOROUGH PRACTICAL

It's just as easy as it looks in these pictures. You learn by DOING. Actual pictures of your instructor's hands guide you. You SEE IT done — and you DO IT yourself. The pictures show you HOW and the text tells you WHY. And you learn about mechanics, shop practice and everything a Draftsman must know. It's just like actually working in a Drafting Room with an expert instructor at your elbow every minute showing you what to do and how to do it. No wonder it's so intensely interesting, so thorough, so quick!

## Step by Step YOU SEE IT

The pictures in this ad show you how easy it now is to learn Drafting. But these are only 5 of the 27 fine drawings and pictures in Job No. 13. And the whole Training is worked out so expertly and clearly that you make real progress right from the start and advance rapidly.

K. M. BOYD

Act today to increase your pay

## Step by Step YOU DO IT

Make up your mind to get into Drafting. It's your Big Opportunity for Big Pay. But don't sign up for any Course until you've learned all about this highly-simplified "See it — Do it" Method. Mail coupon for Big FREE Book. Read all about this wonderful Training and what it has done for other men like you. See the Big Outfit of Draftsman's Tools and Complete Drawing outfit given without extra charge. Read about the Earn-while-Learning Plan, the Nation-wide Job Service and the great Money Back Agreement. Mail the coupon right now.

**K. M. Boyd, Chief Drafting Engineer**
**L.L. COOKE SCHOOL OF DRAFTING**
**Dept 68B, 2132 Lawrence Avenue, Chicago, Illinois**

Send me your book "Draw Big Pay in Drafting" and tell me more about your "See It—Do It" Method. This does not obligate me in any way.

Name .....

Address .....

City ..... State..... Age.....

# and in 90 Days

## Step Into a BIG PAY Job

Learn how to get into this profitable profession where you can be fixed for life with an income of $50 to $150 weekly. ELECTRICITY—the dynamic force of human endeavor—the basis of great wealth and prosperity—beckons you. Learn to master and apply this magical "juice"—the power that keeps the universe in motion. Mail coupon for my big Free McSweeny book and see how easily you can qualify for a big pay job in electricity in only 90 days.

### No Books • • No Classes

McSweeny will teach you in an amazing way—NOT by correspondence, but by new McSweeny "Shop-Plan" Method. No dry books, no printed lessons. It won't take 18 months or more of tiresome study. You learn on actual equipment. You work with real tools with an expert to direct you at every step.

### Education Not Necessary

You don't have to have any special previous education or training, to grasp my simple method of instruction. You don't even need to know anything about electricity now. I don't care if you can't tell a motor from a horse. It isn't necessary. My training is so simple that the most inexperienced can grasp it in the great McSweeny Shops.

### Act on this "No-Risk" Offer

Your next step is to rush me this coupon and get my big Free Book and special low tuition offer. Start now to better yourself without risk on your part. It's easier than you can imagine to get into Electricity the McSweeny way. Act at once. You must be 16 years of age or older. Mail that coupon today.

J. H. McSWEENY.

**McSWEENY ELECTRICAL SCHOOLS**

**Dept. E-11-G, Chester at 30th St.**
**Cleveland, Ohio**

### Learn on Real Equipment

You are taught on real electrical equipment, with real tools. McSweeny Special School Shops are fitted with Switch Boards, Generators, Motors, etc. You get first hand knowledge of A. C. and D. C. Armature Winding, House Wiring, Splicing, in fact everything you need to know to become an electrical expert. I also give you complete instruction on Automobile, Aviation and Radio Electrical Systems and Batteries.

### Guarantee of Satisfaction

I guarantee you satisfaction. I guarantee to continue your instruction of my practical electrical course until you are able to qualify and hold a first class electrical job.

## Mail Coupon for Big FREE Book ..and low Tuition Offer

Mr. J. H. McSweeny, Pres.,
McSweeny Electrical Shops,
Dept. E-11-G, Chester at 30th St.,
Cleveland, Ohio.

Dear Mr. Without obligation send me a copy of your big free book on ELECTRICITY; also details of your remarkable low tuition offer and complete Radio Course.

Name .....

Address .....

Town ..... State..... Age.....

R. T. I. QUALIFIES YOU TO MAKE MONEY AND ITS SERVICE KEEPS YOU UP-TO-THE-MINUTE ON THE NEWEST DEVELOPMENTS IN RADIO, TELEVISION AND TALKING PICTURES

# Good Jobs Right at Your Finger Tips

WHEN YOU ARE TRAINED IN

# RADIO-TELEVISION-Talking Pictures

BIG PAY JOBS! SPARE TIME PROFITS! A FINE BUSINESS OF YOUR OWN! They're all open to you and other live wire men who answer the call of RADIO. The fastest growing industry in the world needs more trained men. And now come Television and Talking Movies—the magic sisters of Radio. Will you answer this call? Will you get ready for a big pay job Now and step into a BIGGER One later on? You can do it EASILY now.

FRED H. SCHNELL
Chief of R. T. I. Staff

Twenty years of Radio experience. Has helped thousands the way success through Home Training. Former Traffic Manager of America's Radio Relay League. Instructor in Radio Communication, Signal Corps Reserve. Consultant Radio Inspector, in charge of R. T. I. Radio Training and you will likely benefit by the personal interest he takes in you and your ambition.

## Home Training Puts You in This Big Money Field

Radio alone, pays over 200 MILLION DOLLARS a year in wages in Broadcasting, Manufacturing, Sales, Service, Commercial Stations and on Board the big sea going ships and many more men are needed. Television and Talking Movies open up other vast fields of money-making opportunities for ambitious men. Get into this great business that is live, new and up-to-date, where trained service men easily earn $40 to $50 per week, and trained men with experience can make $75 a week and up.

## Easy To Learn At Home—In Spare Time

Learning Radio the R. T. I. way with F. H. Schnell, the "Ace of Radio" behind you is EASY, INTERESTING, really FUN. Only a few spare hours are needed and lack of education or experience won't bother you a bit. We furnish all necessary testing and working apparatus and start you off on practical work you'll enjoy—you learn to do the jobs that pay real money and which are going begging now for want of competent men to fill them.

## Amazingly Quick Results

You want to earn BIG MONEY, and you want some of it QUICK. R. T. I. "Three in One" Home Training—Radio-Television-Talking Movies—will give it to you, because it's easy, practical, and is kept right up-to-date with last minute information. In a few weeks you can be doing actual Radio work, making enough EXTRA MONEY to more than pay for your training. In a few short months you can be all through—ready to step into a good paying job or start a business of your own. A BIG JOB—BIG MONEY—A BIG FUTURE. There is no other business in the world like it.

## Investigate—Send For R. T. I. Book Now

Don't waste a minute. Find out what the great Radio industry, which has grown faster than the Automobile and Motion Picture business, has to offer you. Find out what other men are earning. SEE HOW EASILY YOU CAN GET STARTED. Get the facts about Radio, Television and the Talking Pictures, first hand, in the big R. T. I. FREE BOOK. Learn what this R. T. I. "Three in One" Home Training can do for you. Mail the coupon for FREE Book, Now.

RADIO & TELEVISION INSTITUTE
Dept. 68S
4806 St. Anthony Court Chicago

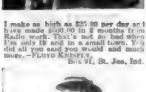
R. T. I. TRAINS YOU AT HOME FOR A GOOD JOB OR A PROFITABLE PART TIME OR FULL TIME BUSINESS OF YOUR OWN



Your radio course has enabled me to earn over $600 in two months. This is all spare time work, as I have a permanent position with my father in our store. I give you all the credit for the above. —J. Bontempo
R. I., Box 37, Greenville, Ky.

I make as high as $25.00 per day as I have made $600.00 in 2 months from Radio work. That's not so bad when I'm only 19 and in a small town. You did all you said you would and more. —Floyd Kennedy,
Box 91, St. Joe, Ind.

I am now Radio Service Manager for the R. B. Knight Supply Co., distributors for Sylvania Radio Receivers in Oklahoma, and Texas Panhandle, with an increase in salary of about 33 1-3 since I enrolled with your school.
—Alva R. Gonson, 618 E. 5th St.
Oklahoma City, O.



RADIO & TELEVISION INSTITUTE
Dept. 68S, 1806 St. Anthony Court, Chicago

Send me Free and prepaid your BIG BOOK "Tune In On Big Pay" and full details of your three-in-one Home Training (without obligating me in any way).

Name .....

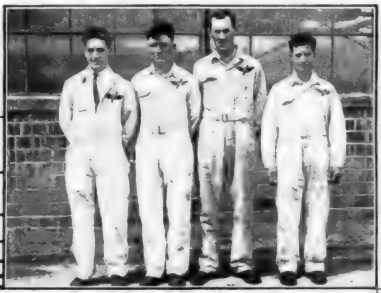
Address .....

City ..... State .....



Thank You for Mentioning Modern Mechanics and Inventions for July When Writing to Advertisers

# Above All – Parks Training is Thorough *and* Sincere



*Four graduates of the Parks Air College Airplane Engine Mechanics' School who are now employed in the factory of the Lockheed Aircraft Division of the Detroit Aircraft Corporation at Burbank, Calif.*

*Left to right, they are —H. L. Gemmill, S. H. Reichert, Hugo Carlson, and L. H. Larivee.*

WHEN you decide to make aviation your life work—whether as a pilot or as an airplane and engine mechanic—the first thing to consider is, "Where can I get the training which will mean *sure success* to me?"

Think *first* of Parks—the finest and most complete commercial aviation school in the country—one of the first to be licensed and approved by the Department of Commerce.

Parks training has fitted many men for responsible jobs in the aviation industry—as pilots, airport executives and mechanics.

Sincerity and thoroughness are the hallmarks of Parks training. Every course is under the personal supervision of Oliver L. Parks. Every instructor is licensed by the United States—a man of proven character and ability. And before the eyes of every man is kept constantly the fact that Parks Air College has a mission—that its superior experience and resources impose upon it the moral obligation of giving its students the finest possible training—that to it the aviation industry is looking as the progressive leader of the field of aeronautical instruction.

A fleet of more than thirty training planes—a half-million-dollar plant—a location unexcelled by any in the country—a variety of training courses to suit your own needs—Parks offers these to you.

Join the ranks of successful Parks graduates. It will reward you with superior training. The coupon will bring you full details.

*Parks Air College was one of the first to be licensed by the U. S. Department of Commerce as a fully accredited transport school*

## PARKS AIR COLLEGE

DIVISION OF DETROIT AIRCRAFT CORPORATION

780 Missouri Theatre Building

ST. LOUIS ⩔ MISSOURI

--COUPON--

PARKS AIR COLLEGE,
780 Missouri Theatre Building, St. Louis, Missouri

Without cost or obligation to me, please mail your illustrated catalog.

I am interested in Pilot's Course ☐ Mechanic's Course ☐

Name .....

Street address .....

City ..... State .....

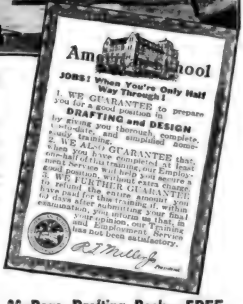
Occupation ..... Age .....

We have placed machinists, carpenters, masons, plumbers, railroad men, office clerks, farmers and even laborers in fine Drafting Jobs under this plan. Mail coupon for details of our remarkable offer.

# Men Who Work With Their Hands

## *Make the Best*

# DRAFTSMEN




## —and we'll back them with this EMPLOYMENT CONTRACT

We are looking for more ambitious young fellows with factory, building-trade or any other kind of mechanical experience to prepare for and help place in well-paid Drafting positions. Such men, we find, are unusually successful as Draftsmen, because they know how things are done, and that's a priceless asset to the man who makes the blueprint plans. Get in touch with me and I'll tell you how you can cash in on your entire past mechanical experience.

"I have landed a job with the Pacific Tel. and Tel. Co. in Seattle, and I must say that I am greatly indebted to the American School for my success. You have done all that you promised in helping me obtain employment."
T. C. White
Seattle, Wash.

"I have obtained a position as a junior draftsman with the Muncie Oil Engine Co., and so far I like the work real well. I appreciate your aid in obtaining this position very much."
M. N. Bareham
Muncie, Ind.

### Drafting Is Logically Your Next Move!

Of course you realize the biggest handicap to mechanical work is that you're limited in earning capacity to the output of your two hands, as long as you live. Even the skilled mechanic earning $50 to $60 a week has reached his limit. He can never earn more and when he gets old he will earn **less.** So I don't blame any man for wanting to get away from this futureless outlook. For wanting to get into something where he can use his **head** as well as his hands—where he will be paid for what he **knows,** instead of only for what he **does** . . . You know enough about blueprints to understand that PLANS govern every move in factory and construction job. The Draftsman who makes them is several jumps ahead of the workman who follows them. And so I want you to know that DRAFTING is a logical, natural PROMOTION from mechanical and building work—better-paid, more interesting—just the kind of work you'd enjoy doing.

### Get Our NO-RISK PLAN

The way to a fine Drafting job for you—is easier than you think. It takes no "artistic talent" or advanced education. Thousands of men no smarter than you, with no more education or ability, have learned it quickly and you can, too. With the co-operation of some of the biggest employers and engineers in the U. S., we have worked out a plan to prepare you for Drafting work in your spare time at home—then to help you get a fine position *when you're only half way through the course.* Mail the coupon and we'll be glad to tell you all about this lifetime chance.

**THE AMERICAN SCHOOL**
**Dept. DB-33, Drexel Ave. and 58th St., Chicago, Ill.**

### 36-Page Drafting Book—FREE

Tells how easy Drafting is to learn—how interesting the work is—what remarkable opportunities are open for Draftsmen right now. Mail coupon for a copy—without cost or obligation.

AMERICAN SCHOOL, Dept. DB-33, Drexel Ave. & 58th St., Chicago, Ill.

Please tell me, without cost or obligation, about your training and employment service in line marked X below.

☐ **DRAFTING**

- ☐ **Architecture**
- ☐ **Civil Engineering**
- ☐ **Building**
- ☐ **Auto Engineering**
- ☐ **Electrical Engineering**
- ☐ **Business Management**
- ☐ **Accounting**
- ☐ **Mechanical Engineering**
- ☐ **Shop Superintendent**
- ☐ **Foremanship**
- ☐ **High School in 2 years**
- ☐ **Structural Steel**

Name_____

St. No._____

City_____ State_____

Age_____ Occupation_____

# There is a JOB for You Here...

## Get Into AVIATION

MAJOR
*R.L.Rockwell*

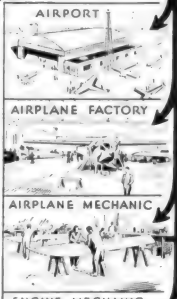
**Will Train You AT HOME, and Until You**

## Get a Job Paying You $300 to $400 a month

Major Rockwell—famous world war flyer, is offering to train a limited number of ambitious men who want to get into aviation and get one of the big pay jobs that aviation offers.

### JUST 12 SHORT WEEKS

All you have to do is devote about an hour or two a day to my Home Study Extension Course and in 12 weeks you will be mastering the principles of Ground Training and be prepared to qualify for and accept a big pay job in this branch of Aviation. If you want to fly, my Home Study Course teaches you the principles of flight. When you have completed the ground training I will arrange for you to take your flying instructions at any licensed airport near your home at special reduced rates. Or if you want you can come here to Dayton and get training at one of the finest and best equipped airports in America. No matter where you learn to fly you can qualify for a pilot's license and a high pay job in passenger lines, mail service, and other important branches of flying.




### Advance Education or Experience Unnecessary

You don't need a high education to master my course. My home course is thorough and complete. Everything is so clearly explained, with easy-to-understand text and pictures, that in a few short months you will be able to grasp every fundamental principle of Aviation ground work and get a start in Aviation qualifying for any important aviation job paying $300 to $400 a month. My Home Study Course will give you all the knowledge necessary to pass the government's written examination for a license.

### How I Help You Get Your Job

Because of my experience in Aviation and knowledge of the work, I am in touch with large employers of trained aviation men who are constantly seeking help. Thus I am able to help my graduates get the aviation job they want at big pay. These employers prefer Rockwell Trained Men.

### Money-Back Agreement

I am so sure that you can learn Aviation with my help and step into a big aviation job that if you are not satisfied when you have finished my course, I agree to return every penny of your tuition. Read my money-back agreement. Act now while my special offer lasts. Rush this coupon to me for a copy of my famous free book.

**MAJOR ROB'T L. ROCKWELL**
**The Dayton School of Aviation**
**Desk G-31 Dayton, Ohio**

### *My Book Explains All ... Sent FREE ...* MAIL COUPON

Major Rob't L. Rockwell
The Dayton School of Aviation
Desk G-31, Dayton, Ohio.

Dear Major: Please send me FREE and without obligation a copy of your famous book on Aviation; the details of your no-risk plan; also your special tuition offer.

Name .....

Address .....

Town ..... State..... Age.....

# Guilty or Not Guilty!

Meet the "Big Shot"—Al Capone, the most-feared and best-liked mystery man in all crookdom!

*Is "Scarface" Al Capone the vicious killer his enemies say he is—or is he the "good guy" his friends swear by?*

*Decide for yourself after you read this amazing story—*

## Al Capone,

## King of the Underworld

IN THE JULY ISSUE OF

**ON SALE JUNE 10TH**

**Startling Detective Adventures**

**AT ALL NEWS STANDS**

ALSO IN THIS ISSUE—

**THE "GORILLA" MURDERER by Sheriff Frank Green**
The inside story of Michigan's most atrocious crime

**KANSAS CITY'S WILDCAT by Wayne Sprague**
The capture of the Middle West's most ruthless bandit.

**THE PHANTOM IN THE HOUSE OF OESTERREICH by Don Nachaidh**
Capturing Los Angeles' terrifying killer.

**THE CORPSE BY THE CAR TRACK by Edward Anderson**
Solving Texas' most baffling murder mystery.

MANY OTHER FACT CRIME STORIES AND FEATURES.

*If your newsdealer is sold out, send 25c to Startling Detective Adventures Magazine, Fawcett Publications, Inc., Minneapolis, Minn., and a copy of the July issue will be mailed to you immediately.*

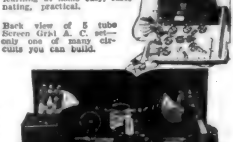
# I will train you at home to fill a BIG PAY Radio Job!

Here's Proof

I will give You my new 8 OUTFITS of RADIO PARTS for a home Experimental Laboratory

You can build over 100 circuits with these outfits. You build and experiment with the circuits used in Crosley, Atwater-Kent, Kennedy, Majestic, Zenith, and other popular sets. You learn how these sets work, why they work, how to make them work. This makes learning at home easy, fascinating, practical.

Back view of 5 tube Screen Grid A. C. set—only one of many circuits you can build.



If you are earning a penny less than $50 a week, send for my book of information on the opportunities in Radio. It is free. Clip the coupon NOW. Why be satisfied with $25, $30 or $40 a week for longer than the short time it takes to get ready for Radio.

**Radio's growth opening hundreds of $50, $75, $100 a week jobs every year**

In about ten years Radio has grown from a $2,000,000 to a $1,000,000,000 industry. Over 300,000 jobs have been created. Hundreds more are being opened every year by its continued growth. Men and young men with the right training—the kind of training I give you—are needed continually.

**You have many jobs to choose from**

Broadcasting stations use engineers, operators, station managers and pay $1,800 to $5,000 a year. Manufacturers continually need testers, inspectors, foremen, engineers, service men, buyers, for jobs paying up to $15,000 a year. Shipping companies use hundreds of Radio operators, give them world wide travel at practically no expense and a salary of $85 to $200 a month. Dealers and jobbers employ service men, salesmen, buyers, managers, and pay $30 to $100 a week. There are many other opportunities too.

**So many opportunities many N. R. I. men make $5 to $25 a week extra while learning**

The day you enroll with me I'll show you how to do 10 jobs, common in most every neighborhood, for spare time money. Throughout your course I send you information on servicing popular makes of sets; I give you the plans and ideas that have been making $200 to $1,000 for hundreds of N. R. I. students in their spare time while studying.

**Talking Movies, Television, Wired Radio are also included**

Radio principles as used in Talking Movies, Television and home Television experiments, Wired Radio, Radio's use in Aviation, are all given. I am so sure that I can train you satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lessons and Instruction Service upon completing.

**64-page book of information FREE**

Get your copy today. It tells you where Radio's good jobs are, what they pay, tells you about my course, what others who have taken it are doing and making. Find out what Radio offers you, without the slightest obligation. ACT NOW.

**J. E. SMITH, President**
**National Radio Institute Dept. OGH**
**Washington, D. C.**

**$100 a week**

"My earnings in Radio are many times greater than I ever expected they would be when I enrolled. They seldom fall under $100 a week."
E. E. WINBORNE,
1414 W. 48th St.,
Norfolk, Va.

**Jumped from $35 to $100 a week**

"Before I entered Radio I was making $35 a week. Last week I earned $110 servicing and selling Radios. I owe my success to N. R. I."
J. A. VAUGHN
3715 N. Kingshighway,
St. Louis, Mo.

**$500 extra in 6 months**

"I find I made $500 from January to May in my spare time. My best week brought me $107. I should have taken it long ago."
HOYT MOORE
R. R. 3, Box 919,
Indianapolis, Ind.

I am doubling and tripling the salaries of many in one year and less Find out about this quick way to BIGGER PAY

Radio Needs Trained Men

FILL OUT AND MAIL THIS COUPON TODAY

J. E. SMITH, President,
National Radio Institute, Dept. OGH,
Washington, D. C.

Dear Mr. Smith: Send me your book. This request does not obligate me.

Name .....

Address .....

City ..... State .....

Lifetime Employment Service to all Graduates

# PATE

## Protect Your Ideas

### Take the First Step Today

If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U. S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon on the opposite page.

### Prompt, Careful, Efficient Service

This large, experienced organization devotes its entire time and attention to patent and trade mark cases. Our offices are directly across the street from the U. S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office. We can proceed in the quickest, safest and best ways in preparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trademark owners located in every state in the Union.

### NO CHARGE for Information
### On How to Proceed

The booklet shown here contains valuable information relating to patent procedure that every inventor should have. And with it I will also send you my "Record of Invention" form on which you can sketch your idea and establish its date before a witness. Such evidence may later prove valuable to you. Simply mail the coupon and I will send you the booklet, and the "Record of Invention" form, together with detailed information on how to proceed and the costs involved. Do this NOW. No need to lose a minute's time. The coupon will bring you complete information entirely without charge or obligation.

My Offices Just Across Street From U. S. Pat. Office

# NTS

Above is a view of my drafting and specification offices where a large staff of experienced experts are in my constant employ. All drawings and specifications are prepared in my offices.

## *Inventors Write for these* Free Books

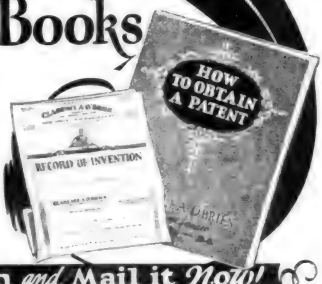
### Strict Secrecy Preserved

All communications, sketches, drawings, etc., are held in strictest confidence in strong, steel, fireproof files, which are accessible only to authorized members of my staff. Feel free to write me fully and frankly. It is probable that I can help you. Highest references. But FIRST—clip the coupon and get my free book. Do THAT right now.

### Clarence A. O'Brien

*Registered Patent Attorney*

Member of Bar of: Supreme Court of the United States; Court of Appeals, District of Columbia; Supreme Court, District of Columbia; United States Court of Claims. Practice confined exclusively to Patents, Trademarks and Copyrights




**Clip this Coupon *and* Mail it *Now!***

CLARENCE A. O'BRIEN, *Registered Patent Attorney*

317-J Security Savings and Commercial Bank Building
WASHINGTON, D. C.

**(or, Suite 1106, Dept. C-1, Woolworth Bldg., New York City)**

Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" form without any cost or obligation on my part.

Name

Address

(Important—Write or print plainly, and address office nearest you)

# No Gas! No Electricity!

## The ONLY PRACTICAL Mechanical Refrigeration for Small Towns and Rural Districts

Powel Crosley, Jr., president of the Crosley Radio Corporation, offers an amazing new type mechanical refrigerator that requires no gas or electric power. Now every home in small towns and in rural districts can enjoy the convenience of mechanical refrigeration at a cost of only 2c a day. The wonderful Crosley ICYBALL Refrigerator keeps food perfectly, prevents food spoilage, and protects the health of every member of the family. It is self-contained and is renewed daily by heat with the simple heat unit furnished. Requires no servicing—has no breakdowns and is absolutely guaranteed. Over 30,000 in use on farms, ranches, in homes and camps in all parts of the world. A real blessing to folks who want this luxury and haven't electric current available. Mail coupon for complete details of this amazing mechanical refrigerator.

**CROSLEY**
**ICYBALL**
**REFRIGERATOR**

**CROSLEY ICYBALL DIVISION**
**1125 Arlington St. - - Cincinnati, Ohio**

## AGENTS / SALESMEN!

**Chance to Make $10,000 Yearly Selling ICYBALL Direct to Homes**

An opportunity is open to ambitious men to represent Crosley ICYBALL Refrigerator who can reach small towns and rural districts. This is the product of the Crosley Radio Corporation. You need not know anything about refrigeration—no technical experience is necessary. No servicing problem, no installation difficulties. The ICYBALL comes to your customer COMPLETE with beautifully finished STEEL cabinet, superbly insulated, the amazing ICYBALL refrigerating unit, special heating unit with stand. CHEAPER than ice and infinitely better. Mail coupon at once and get particulars and learn how you can get your own ICYBALL without cost

## Mail Coupon for Details

Powel Crosley, Jr., President
**CROSLEY ICYBALL DIVISION**
1125 Arlington Street, Cincinnati, Ohio.

Tell me about the OPPORTUNITY to represent the Crosley ICYBALL Refrigerator and how I can get my own ICYBALL Refrigerator WITHOUT COST.

My Name .....

My Town or R. F. D. .....

County ..... State .....

# To the man whose ship never quite comes in

"WHEN my ship comes in," you say—but your smile cannot hide the worry gnawing at your heart—

A fine sea-going vessel you thought that ship of yours when you launched it on the business ocean—

Yet the days and months and years slip by—and though others see their ships ride triumphantly to harbor, still you scan the horizon anxiously for a ship that never quite makes port.

No one's *fault*, perhaps—but what a misfortune that so many business ships should founder on a hidden reef or a treacherous shoal, when the channels to Success are plainly charted *and a chart for every channel is available to every thinking man!*

### *How the "Right" Chart Increased E. T. Orcutt's Income 500%*

Certainly *my* ship-of-fortune seems far off its course, said E. T. Orcutt, in effect, when as railroad clerk at $20 a week he enrolled with LaSalle for home-study training in Traffic Management.

Before he had completed the training, however, came an opportunity with Hitchings & Co., Elizabeth, N. J., one of the largest manufacturers of greenhouses in the world.

Training had set his "ship" on the right course. Later, as sales manager and still later as head of his own firm, he continued training with LaSalle—in Business Management.

*Since taking his first course, his income has increased more than 500 per cent.*

### *How G. W. Clason Placed His "Ship" on the Right Course*

No bands were playing when G. W. Clason launched his "ship" upon the business ocean.

Clason had left school at 14, and at 19 his job was to take care of all the horses in the barn of a laundry.

"Never mind," said G. W. Clason, "*I'll make my opportunity right where I am!*"

So he learned the laundry business, and at 28 was operating his own plant. When fire wiped his business out, he started again. Unable to finance properly—*thru lack of business understanding*, as he testifies—he sold out and became superintendent of the Ideal Laundry Company, Spokane, Washington.

Right then he made up his mind to remedy his lack—and enrolled with LaSalle for training in Business Management.

Today, at 48, he is vice-president and a director of this successful company, and commands an income several times as large as when he started with LaSalle six years ago.

"I'll give all credit to my LaSalle training," writes Mr. Clason. "It has proved by far the most profitable investment I ever made."

### *No More Drifting! Send for These Free Books—Today*

Are you letting your ship-of-fortune drift where it will—or are you charting its course to the Harbor of Success?

There's a route that will take it straight to its destination. LaSalle can help you find it.

Without cost or obligation the coupon will bring you your free copy of a 64-page booklet fully describing the opportunities in the business field that most appeal to you, and showing you how you can turn those opportunities into cash.

Are you going to keep on waiting on the shore of life when others have long since brought their ships to harbor? Fill in, clip and mail the coupon NOW!

----- *Find Yourself Through LaSalle!* -----

## LaSalle Extension University

*The World's Largest Business Training Institution*

Dept. 7493-R Chicago

I would welcome an outline of the LaSalle plan, together with a copy of "Ten Years' Promotion in One," all without obligation.

Ten years' promotion in one

- ☐ Business Management
- ☐ Modern Salesmanship
- ☐ Higher Accountancy
- ☐ Traffic Management
- ☐ Law: Degree of LL. B.
- ☐ Commercial Law
- ☐ Modern Business Correspondence
- ☐ Credit and Collection Correspondence
- ☐ Railway Station Management
- ☐ Telegraphy
- ☐ Railway Accounting
- ☐ Stenotypy—Stenography
- ☐ Banking and Finance
- ☐ Modern Foremanship
- ☐ Personnel Management
- ☐ Industrial Management
- ☐ Expert Bookkeeping
- ☐ Business English
- ☐ Commercial Spanish
- ☐ Effective Speaking
- ☐ C. P. A. Coaching
- ☐ Paper Salesman's Training

Name .....

Present Position .....

Address .....

# PATENTS TRADE-MARKS AND COPYRIGHTS

## OUR OFFER: FOR PROTECTION OF YOUR INVENTION

**YOUR FIRST STEP.** The inventor should write for our blank form—**"RECORD OF INVENTION."** A sketch and description should be made on this Blank, signed, witnessed, then returned to us. **We also give our opinion** as to whether the invention comes within the Patent Office definition of a patentable invention. This "Record of Invention" will serve as "proof of conception." **There is no charge or obligation for this service.**

**Write for Our FIVE Books Mailed Free to Inventors**

**Our Illustrated Guide Book**

### HOW TO OBTAIN A PATENT

Contains full instructions regarding U. S. Patents. Our Methods, Terms, and 100 Mechanical Movements illustrated and described.

### OUR TRADE-MARK BOOK

Shows value and necessity of Trade-Mark Protection. Information regarding **Trade-Marks and unfair competition in trade.**

### OUR FOREIGN BOOK

We have Direct Agencies in Foreign Countries and secure Foreign Patents in shortest time and at lowest cost. **Progress of Invention** contains description of World's Most Pressing Problems by Leading Scientists and Inventors. **All Communications and Data Strictly Secret and Confidential.** Interference and Infringement Suits Prosecuted.

### DELAYS ARE DANGEROUS IN PATENT MATTERS

**IMPORTANT! To Avoid Delay!**

**YOU SHOULD HAVE YOUR CASE MADE SPECIAL IN OUR OFFICE** to save correspondence, secure protection and early filing date in the Patent Office. To secure **special preparation** of your case send $25.00 on account with model or sketch and description of invention. If the invention is not patentable we will return fee less cost of search.

***Our Lawyers Practice in all U. S. Courts and Defend Clients in Suits involving Patents, Trade-Marks and Copyrights***

**OUR ORGANIZATION OFFERS PERSONAL SERVICE**

**By Experienced Patent Lawyers, Solicitors and Draftsmen**

**We regard a Satisfied Client as our best advertisement, and furnish upon request, lists of clients in any state for whom we have secured patents. We also assist our clients to sell their inventions.**

### PAYMENT OF FEES IN INSTALLMENTS

**It is not necessary that the total cost of a patent be paid in one payment. We permit our clients to pay for their applications in three installments as the preparation of the application progresses in our office.**

***Highest References — Prompt Service — Reasonable Terms***

WRITE TODAY

FREE COUPON

## VICTOR J. EVANS & CO.

**Registered Patent Attorneys Established 1898**

**MAIN OFFICES: 672 Ninth St., Washington, D. C.**

**BRANCH OFFICES: 1007 Woolworth Bldg., New York City; 828 Fidelity Phila. Trust Bldg., Philadelphia, Pa.; 514 Empire Bldg., Pittsburgh, Pa.; 1640-42 Conway Bldg., Chicago, Ill.; 1010 Hobart Bldg., San Francisco, Calif.**

Gentlemen: Please send me FREE OF CHARGE your books as described above.

Name.....

Address.....

# Introduce Me To 10 Ladies

## *And I Pay You Cash For Your Time*

Here's an utterly new, easy way for honest men and women to make money, and also the strangest offer we ever heard of. Just introduce me to 10 ladies and say 20 magic words and this million-dollar company will pay you cash. No need to sell a single thing. This is the revolutionary new plan of the famous business genius—C. W. Van De Mark—the wizard who has already put more than 25,000 men and women on the road to prosperity. "Conservative" business leaders called Van "crazy" for making this radical cash pay agreement. They said it would ruin "conservative" traditions. Cooler heads called it a master stroke that would boost prosperity. For Van will now actually pay you a cash penalty if you don't make at least $15 the very first day.

## No Need To Sell Anything

### *To Get Your Cash Pay*

Now Van himself reveals the sensational truth: Countless housewives have learned that they can make big savings on our amazing bargain offers. So in almost no time the sale of our products has expanded almost to the "bursting" point. Now we must hurry and employ 1100 more local men and women to take care of regular customers in each town. Time must not be wasted! Orders must be filled quick! Customers must not be kept waiting! Big money for our representatives means nothing to us from now on! To save time I now offer every honest man and woman steady work and will pay cash for just a few hours of their spare time. You don't need to sell anything to get this cash pay.

## I Pay You a Cash Penalty

### *If You Don't Make Big Money From The First Day*

JUST say 20 magic words to 10 ladies a day—20 secret words that have proven almost magical money-getters for over 25,000 of my "partners". I not only pay you an actual cash penalty if your first 10 calls do not give you a good profit—I go further! I even give you 50% profit on every order my customers give you. So what is to stop you from making as high as $35.00 in a day like some of my other partners? I don't let you risk one penny. To show you that I handle big things in a big way, I will send you $13.00 (retail value) worth of my products right out of stock to start you. Don't send a cent for this daring offer—just rush coupon. Maybe you think this is just ordinary work. But don't be mistaken. If you treat me fairly, I'll set you up in a business of your own. I'll tell you a priceless secret that will put others to make money for you. Right now I promise to help you toward ending your money worries forever, and I am known to 25,000 partners as the man who *always* keeps his promises. If up to $15 in a day will end your money worries, then mail the application below right now for this astonishing cash pay offer. Start in spare time if you wish. If you are a married woman, you can surely devote a few spare hours a day. My plan is a funny one. Some of my women "partners" have actually made more money in a single day than their husbands make.

**I Send You $13.00 Worth of Goods**
(Retail Value)
***Without Risk To You.***
***To Start You Just Send Coupon.***

**Get Van's Cash Agreement**
Just tell me how much you want—
**$15.00 in a Day Full Time?**
**$3.00 in an Hour Spare Time?**
and I will send my Written Agreement, legal and binding upon me. The more time you devote to this business the more money you get. Van.

**$25,000.00 Bond Backs Our Guarantee**

## Rush Pay Application

### *Send No Money*

I need 1100 more "partners" quick to start on my daring new Cash Pay plan. This announcement will probably "unset" the nation. Untold thousands will apply for these openings. If you delay, it may be too late. Right now—mail the employment Application below for this daring Cash Pay plan, offer of $13.00 worth of my goods (retail value) and the 20 secret words that may mean a fortune to you. Send no money. Just application. *This is not an order.* You do not pay anything for this offer. *Nothing will be sent C.O.D.* **Curtis W. Van De Mark, President, The Health-O Quality Products Co., Dept. 2034-GG, Health-O Bldg., Cincinnati, Ohio.**

**Curtis W. Van De Mark, President**
**The Health-O Quality Products Co.**
**Dept. 2034-GG, Health-O Bldg., Cincinnati, Ohio.**

Dear Van: I hereby apply for opening as "partner" in my town to start on your new cash pay agreement. Send offer of $13.00 worth of products (retail value) and written guarantee. Also tell me how I can get cash pay introducing you to 10 ladies and saying the 20 magic words that make fortunes. *This is not an order—send nothing C. O. D.* I risk nothing. I want $ ..... per hour.

Name .....
Address .....
City ..... State .....

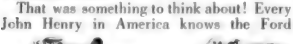
A wing over! This is one of the joyful maneuvers every pilot learns to like. Here it is shown as it might be done in a two seater, high wing ship.

# The SHOP MAIL BOX

**Andy, Modern Mechanics' own grease monkey, has turned columnist, and is now dispensing news, chatter and general gossip to his heart's content. How he toots what he likes, and how he can pan us when he doesn't agree. Don't miss Andy's line of type!**

HOITY toity, you monks! Get a load of this for scandal: the other day a fellow walks into the office of the eds and says, "My name's Pietenpol. I've built a plane down in southern Minnesota that flies swell with a Ford model A engine. It's a two seater." We scratched our heads. He was a quiet guy—the kind who knows his stuff. He startled me.

That was something to think about! Every John Henry in America knows the Ford



model A engine is one of the most reliable low speed four cylinder internal combustion engines ever designed. They are free from vibration as the winds of a May morning, and *reliable* as a church. They'll idle like a steam engine, or run all day long wide out without a complaint. And they'll run for thousands of miles before even a valve needs touching up. And they aren't heavy.

Now the crying need in aviation today, the thing every air-minded tarmac skimmer wants is a good two seat light airplane, one that can be built dirt cheap, one that is as husky as a Jenny, and one that will fly like a Waco. Says me to myself, "The guy that has a ship like that is answering Young America's prayer." He can hop friends, barnstorm with pay loads, pile up hours and go camping to his heart's content any time he feels like it.

So we says to Pietenpol, lookin' him right in his flyin' eyes, "Fly her up here. Let's take a look at her."

I expected nothing more'd be heard from

*(Continued on page 26)*

# FUN-MAGIC-MYSTERY

# FUN-MAGIC-MYSTERY

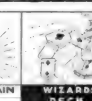
## FROM "THE STORE OF 1000 WONDERS"

**JOKE REVOLVING PICTURES**

ove your friend a ne blank card small distortion-scope, ose and covered with black ocket, dipped in diamond ork. Looking through ove an imaginary ches, he starts big ! ook ring around the ... Lots of fun ! ctra blacking free. ter 25c

**SIBERIAN CHAIN ESCAPE**

He an Escape King! Have this solid chain snapped about your wrists and locked with any lock and the key-hole sealed. Yet you cape within five seconds! Everything can be examined. Nobody else can escape without the secret. No skill required. **Complete with lock and chain, 50c**



**WIZARDS DECK**

Mystify by the hour with a wizard deck! The secret is in the cards—no skill needed. Looks like regular deck and can be used in any card game. Any 2 cards pulled at random instantly heard of; merely drawn card; pass card thru table—many others easily learned. Price 75c

**MULTIPLYING BILLIARD BALLS**

A famous stage Trick! Vanishing Balls! Starting with one ball, has been the amazement and wonder of the inside circle for years. A mysterious wave and they multiply to three, then four. They vanish the same mysterious way. Easy to learn. Very mystifying. Packet set 50c; Regular size 75c

**CIGARETTE IN HANDKERCHIEF**

Most popular trick to amuse an audience. A borrowed handkerchief completely vanishes leaving handkerchief unharmed! Easy to do. No skill needed. Complete outfit only 35c; Best grade 50c

**TRICK LOAF**

The more you use it, the dirtier you get! One of the most popular of all jokes and the easiest to work. Simply leave it in the washroom and watch results. Takes real soap and hot water to remove the stains. Price 15c; 2 for 25c.

## RUBBER JOKE NOVELTIES

| | |
|---|---|
| Rubber Cheese Tips in Box | $0.25 |
| Rubber Nuts in Box | .20 |
| Rubber Cigarettes 3 for | .10 |
| Rubber Cigars, 3 for | .25 |
| Rubber Eggs, 3 for | .25 |
| Rubber Tacks, 6 for | .10 |
| Rubber Gum, pkg. | .10 |
| Rubber Dagger | .10 |
| Rubber Point Pencil | .10 |

## MAGIC SECRETS 25c & 50c

**Strangle Halter.** Rope tied around your neck. Person in each end pulls rope tight. Instantly you are free, the rope found innocently entwined around your neck!

**Floating Ball.** A ball made of ordinary newspaper is made to float in the air, rise, fall, etc., at command of performer.

**Two Napkins Restored.** A famous trick. Two napkins torn into bits, restored to their right before you. When unfolded a moment later, it is restored and both hands shown empty.

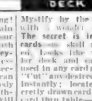
**Water to Wine.** Clear water poured in one glass, vanishes, then, into the empty glass turns to wine; both mixed back into the full-to-the-brim glass in complete instructions for performing.

**Rising Ring.** A ring dropped on an ordinary pencil rises and falls at command of performer.

**Crosby Coin.** Borrow dinner table trick A glass of water is balanced at a coin made on the table where it defies the laws of gravity.

**Human Adding Machine.** A long column of figures written by audience is instantly totaled. Total also correctly written before the column is even put in paper! Very mystifying.

**Needle Eating.** Performer eats quantity of thread and places piece of needles in his mouth. At once they are pulled out every needle threaded on the thread. A famous trick you can do.

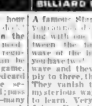


**6 MASTER COIN TRICKS 25c**

Coin Tricks are easy to do any time, anywhere. This set requires no skill—only practice and quick legerdemain. No preparation necessary. Each trick called upon to entertain. These six tricks will get more money than popularity. Set consists of: "Mystery"; "The Penetrating Coin"; "Swallow a Coin"; "The Mysterious Glass"; "Three Coin Puzzle" and "Simples Vanish." Complete instructions for all. **25c**

**Bingo Exploder**

Lots of fun with this novel noise making outfit—for any object. Use with a Bang. Also used as burglar alarm. **2 for 25c; 5 for 50c**



**WORLD'S SMALLEST RECEIVER**

A small black box, illustrated. It seems impossible to be so small. All your friends will want to see it. What a roar when they do! Price **35c**

**MAGIC BALL VASE**

A handsome enameled Ball Vase is shown empty. A ball is placed therein and covered up. Upon command it disappears from the Vase and appears in your pocket. Put-ting it back in your vase, upon command it to reappear in your pocket, which instantly vexy startling. No skill required. **Only 25c**

**STAGE MONEY**

**50 !!!!!! 25c**

Flash a big roll! Surprise your friends with sudden riches.

**IMPS ENCHANTED BOTTLES**

Defies the law of gravity! You can't hold bottles down, but no one else can. When they try, the bottles stand upright! Easy to do, but very bewildering. A dandy trick-set-stunt. Complete with 2 bottles. **25c**

## SURPRISE JOKE NOVELTIES

| | |
|---|---|
| Loaded cigaret Button | $0.15 |
| China Egg Teeth set | .25 |
| Celluloid Teeth set | .15 |
| Jump Apart Pencil | .25 |
| Imitation Ink Blot | .10 |
| Boot Whistle | .35 |
| Snapper Cigar | .15 |
| Squirt Ring | .15 |
| Lola Bare Dancer | .10 |
| Shooting Pencil | .50 |
| Shooting Book | .35 |
| Shooting Book Cards | .35 |
| Shooting Fountain Pen | .50 |
| Shooting Flashlight | .50 |
| Jumping Match Case | .25 |
| Burlesque Diamond | .25 |

## GOOD PARLOR TRICKS

| | |
|---|---|
| Rising Card | $0.15 |
| Vanishing Coin | .35 |
| Spider Dancing Cotton | .50 |
| Cigarette Vanisher | .25 |
| Magic Age Cards | .10 |
| Card Mind Reader | .15 |
| Disappearing Spots | .10 |
| Forever Hat | .15 |
| Nail Thru Finger | .25 |
| Vanishing Cigar | .15 |

## LATEST PUZZLES

| | |
|---|---|
| Bootlegger Puzzle | $0.15 |
| Wizards Key | .50 |
| Elk Heads | .15 |
| Shamrock Puzzle | .15 |
| Witches Broom | .25 |
| Sliding Blocks | .25 |
| Chinese Rings | .25 |
| 3 Horse Shoe | .10 |
| Link the Links | .10 |
| Spiral and Ring | .10 |
| Chinese Purse | .50 |
| Boot & Bottle | .25 |
| Tree-Bell | .35 |
| Mysterious Cross | .25 |
| Famous 15 | .15 |
| Yamata Block | .15 |
| 15 pc Wood Puzzle | .35 |
| Bell Rope Puzzle | .15 |
| Bamboo Puzzle | .15 |
| Bolt & Ring | .50 |

## POPULAR BOOKS

| | |
|---|---|
| 12 Tricks with Cards | $0.30 |
| Famous Telling by Cards | .25 |
| Tricks with Coins | .25 |
| 100 Ways Kissing Girls | .25 |
| Manual for the Amateur | .30 |
| 50 Parlor Tricks | .25 |
| Mysterious Card Tricks | .25 |
| Magic Palmistry | .35 |
| Practical Ventriloquism | .35 |
| Card Sharpers Tricks | .35 |
| Group Dream Book | .35 |
| Occult Gazing | .25 |
| Hypnotism—25 Lessons | .25 |
| 5th & 6th Book Moses | .60 |
| Secret Book Black Arts | .50 |

## MAGIC BOOK 10c

Where Magic is performed, the crowd gathers. Our Tricks will make you popular. Our "Book of 1000 Wonders", over 100 pages, explains many interesting tricks with Coins, Cards, Handkerchiefs, etc., you can do. Also contains a Catalog of Magic Tricks, Jokes, Puzzles, Escapes, Curios and Imported Novelties from many Foreign lands. Handy assortment. Lowest prices. You will amaze and mystify your friends! Send only 10c today.

Order direct from this page. All goods postpaid. Smallest order accepted is 25c. Remit by Money Order, Currency, Stamps or Check. Address your letters to:

# LYLE DOUGLAS

*"The Store of 1000 Wonders"*
Station A-22 DALLAS, TEXAS

## *Ford Powered Ship Shows Up*

*(Continued from page 24)*

him. He disappeared, wrote and asked which ships—*ships*, mind you—we'd like to see. It seems that he'd built five of them, experimenting here, changing there, until he had a ship that was an airplane and a half. We answered, and thought he'd show up about as probably as a trans-Atlantic flyer.

Then—

A few days later two ships came up out of the south from the Iowa line, and buzzed over Shank's airport at Robbinsdale—the same field all of MODERN MECHANICS' flyin' is done from, the same field that has started off so many flying record holders. They appeared to be clocking it off in good style, and they left a brand new OX5 Swallow Training Plane behind them like the TP was an obstruction to navigation.

With the sweetest tickety-tick you ever heard in an idling engine they both set down on the tarmac at Robbinsdale. They looked a lot like that daddy of American lightplanes, the Heath Parasol, and were about a fifth larger. Say, they were sweet!

And bejabbers, out steps Pietenpol and a flyin' fiend named Don Finke, one of the sweetest lightplane pilots who ever wangled a stick! And both jobs were two seaters, and how! And both planes had the most simple, clean and immaculate Ford model A engine installation imaginable. It was a relief to me, after workin' on OX5's, and Thomas-Morses, and Wrights, to see a motor so clean that all there seemed to be was four cylinders, a base and the hold-down bolts. Wotta relief, wotta nairplane! Her name is the PIETENPOL CAMPER.

Well, we're runnin' the Driggs Dart now, and the FLYING MANUAL may be out with the Pietenpol Camper before the plans get into the mag, so watch that newsstand for the next flyin' year book.

* * *

This cookie called Uncle Otto Schaefer, down at 1752 15th St., Milwaukee, Wis., who does such original work with small engines and castings, sends the eds this letter:

My Dear Sirs:
Incloesd find a few prints SL300 lineshaft S.O.E. 20 Eng. A. C. 50 air compressor just to show you how I am progressing. I certainly will be tickled if you have my little boat Eng. in July issue. Thanks very much so far.

Yours truly,
OTTO SCHAEFER.

Isn't Uncle Otto's engine a neat piece? We understand he is selling castings and parts for this motor—parts which are already machined and which you can put together yourself.

* * *

BY JOE! My mail has been gettin' mighty heavy these last few weeks, and instead of commentin' on the whyness of what's going on I'll take care of dishing the latest dope at the end of this w.k. colyumn. First, bein' an upright and righteous grease monkey, I'm running some of the notes that have been sent me—shooting 'em right into six point so that you who run may read. I'm glad to hear from the Gang and a lot of interesting stuff goes on out on the battle front of reader interest—I can't help passing it on. Here, for instance:

Dear Sirs:
Incloesd is a picture of myself and the Russell Henderson monoplane I built from the 1929 Flying Manual. The plane is almost finished and will soon be ready for a tryout. It has been pronounced O.K. by all the local airport officials.
This is a good answer to Mr. Shirley, of San Francisco, Calif., who says the plans presented in the M. M. are merely bait to sell the product shown. My plane has been built entirely thru the plans and details presented in the M. M. and I find them as clear as any blue print I have ever read.
Yours for a wider circulation and a more enlightened public.

S. N. REINHARDT.
Portsmouth, Ohio.

You'll see Mr. Reinhardt's pic in this column of chatter, too, by cracky. I claim he's done a sweet job. We have no official numbers, but we suppose we can assign No. 401 as being about right—that many probably having been built by M-M readers in different parts of the globe.

*(Continued on page 28)*

* * *

**Here is the Russell-Henderson ship built from Flying Manual plans by S. N. Reinhardt, of Portsmouth, Ohio.**

# "DON'T! You'll make him the laughing stock of the place"

***but when he started to play the piano . . .***

WHAT a glorious night! Henri's quaint restaurant was crowded with joyful parties. Tonight, John Brent was giving a party for eight in honor of Helen Thompson's engagement. Dick Peters had recommended Henri's as a splendid place to dine and dance. And Dick was right.

"What's that in your pocket, Dick? Your will?" asked John.

"No, that's just some sheet music I bought on the way over," returned Dick.

"What in Heaven's name are you doing with sheet music? Going to use it as wall-paper?" exclaimed John.

"Why, I'm learning to play the piano. Didn't you know?"

"Oh boy! Listen to that! You couldn't learn to play in a thousand years."

Dick looked at John with an amused smile on his face.

"What would you give to hear me play?" he asked calmly.

"A ten dollar bill if you'll go up there right now and play that piano. What do you say?" exclaimed John with triumph in his voice.

"You're on," replied Dick, quick as a flash. "I'll take you up on that little dare. But not here—wait 'til we get home tonight."

"No, sir, you'll win or lose that bet right now. Come on, fellows, let's take him right up to the piano and we'll settle it here."

"Don't be foolish, boys, you'll only make us the laughing stock of the place," begged one of the girls.

Heedless of Dick's pleading, they dragged him to the platform and placed him at the piano. By this time the unusual goings-on had caught the attention of everyone in the restaurant. Now Dick realized that he had to go through with it. So summing up all his courage and with a sudden burst of confidence, he broke into the chorus of the latest Broadway hit.

John gasped. He couldn't believe his ears. Everyone at the table sat in open-mouthed amazement as Dick sat there playing one snappy number after another. It wasn't until the regular orchestra returned that they allowed Dick to rise from the piano. Amid the din of applause, he went back to the table, only to be swamped with questions. But Dick refused to tell them the secret of his new-found musical ability, in spite of all their begging.

Going home that night Dick finally gave in.

"Well, John, I've put one over on you. I learned to play by myself, without a teacher."

"What? That's impossible! Tell me more."

## Dick Tells His Secret

Dick then explained how he had always longed to be able to play some musical instrument. One day he chanced to see a U. S. School of Music advertisement offering a Free Demonstration Lesson. Skeptically he sent in the coupon. When the Free Demonstration Lesson came he saw how easy it was. Why, it was just like A-B-C. He sent for the entire course and almost before he knew it, he was playing real tunes and melodies. And the lessons were such fun, too. Almost like playing a game.

* * *

This is typical of the success of countless thousands who have learned music this easy way. You, too, can now learn to play—right at home—in half the usual time. You can't go wrong with this simple new method. Forget the old-fashioned idea that you need special "talent." Just read the list of instruments, decide which one you want to play, and no matter which instrument you choose, *it will average only a few cents a day.*

## Send for Free Booklet and Demonstration Lesson

Our wonderful illustrated Free Book and our Free Demonstration Lesson explain all about this remarkable method. They prove just how anyone can learn to play his favorite instrument by note—playing real tunes from the very start. Also explains all about the amazing new *Automatic Finger Control.* Act NOW. Clip and mail this coupon today! No obligation. Instruments supplied when needed, cash or credit.

**U. S. School of Music,**
2627 Brunswick Bldg.
New York City

**PICK YOUR INSTRUMENT**

| | |
|---|---|
| Piano | Violin |
| Organ | Clarinet |
| Ukulele | Flute |
| Cornet | Saxophone |
| Trombone | Harp |
| Piccolo | Mandolin |
| Guitar | Cello |

Hawaiian Steel Guitar
Sight Singing
Piano Accordion
Italian and German Accordion
Voice and Speech Culture
Drums and Traps
Harmony and Composition
Automatic Finger Control
Banjo (Plectrum, 5-String or Tenor)

U. S. SCHOOL OF MUSIC,
2627 Brunswick Bldg., New York City

Please send me your free book, "Music Lessons in Your Own Home," with introduction by Dr. Frank Crane, Free Demonstration Lesson and particulars of your easy payment plan. I am interested in the following course:

.....

Have you above Instrument?

Name .....

Address .....

City ..... State.....

## *Uncle Otto's Clever Toy Engine*

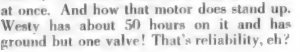
*(Continued from page 26)*

Simple steam or air engine built by Uncle Otto.

The *Pietenpol Camper*, (short for Air Camper) climbs like a Swallow or Waco with two people, and is about a 75 miler. Built like a church or a cathedral, with plywood fuselage or steel tube, whichever you want, and has a lot of D. H. Moth stuff on her design. Flies sweetly with simple plywood pontoons, too.

One of the biggest surprises of the day was the flying of the whole mosquito fleet off the field. Peelot Finke hopped Westy Farmer's Parasol, and Pete Pietenpol hopped his newest Ford job. The Heath went by the Camper handily, and just trimmed the pants off an OX5 job. It goes to show that the Parasol is still about as hot a one seater as you could ask for. What a snarl her little Heath motor has! About like 5,723 mad bumble bees all let loose at once. And how that motor does stand up. Westy has about 50 hours on it and has ground but one valve! That's reliability, eh?

* * *



### Now, take this one—

Dear Sir:

I would like to know if I could get a blue print at a low price for a 15-foot motor boat with an inboard motor, one of the speedster type.

I would like to have one that would hold 6 to 8 persons, and would make about 35 to 40 miles per hour.

I have a big six Studebaker motor that I am going to use. The motor is rated at 36 h.p. and will develop 75 h.p. at full throttle. I would like to know what size propeller to use, and also the pitch and number of blades.

I would like a blue print for one that sits two people up in front and four in rear with the motor in between.

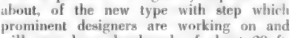
I work in a wood working mill shop and two other fellows and myself are going to start building the boat as soon as we can get the plans.

Very Sincerely,
MALCOLM ROBINSON,
309 Broadway, Westwood, N. J.

Well, sir, Male Robinson's letter was addressed to Westy Farmer, who has been a boatman from the cradle up, and Westy replies as follows:

Dear Mr. Robinson:

I would advise using a smaller motor of marine type if you really want to get performance. Automobile engines will serve for boat work if the work is of a heavy duty, slow revolution type. Anyway, no 15 foot motor boat ever built will take a motor like your Studebaker (which is heavy) and do 35 to 40 miles an hour, let alone carrying 6 to 8 persons. A light hydroplane runabout, of the new type with step which prominent designers are working on and will soon have developed, of about 20 ft. length, with a 40-60 h.p. high speed light



weight marine engine, would carry 6 to 8 people and would make about 25 m.p.h. with that load. Light it would do about 30 m.p.h. The trouble with the picture as you present it is the same as that involved in picturing a very small airplane carrying a heavy load on altogether insufficient power. Don't try it. The picture doesn't "fit."

Sincerely,
WESTON FARMER,
Naval Architect.

Westy ought to know, because he has designed a slough of 'em and he knows his book on runabouts and hydroplanes and small boats in general like nobody's business.

That 4th of July fireworks yarn by Fritz Schubert in this issue, page 110, will give a lot of you kemical kookers some fun for a while. The snake manufacture with sugar was the high light of that yarn, to me. They crawl, they creep, you see 'em in your sleep, —those things! A day's play with this stuff and you'll be an experimenter right. You'll lose all notion of time and space after playing with these snakes, and like the absent minded professor, you'll pour cream on your head and scratch your cornflakes.

* * *

On page 101 you see something remarkable—an auto engine, a standard Franklin air-cooled car engine, flying a Waco ten biplane. That means a lot. Engines in cars are not so temperamental these days, and can pull a whale of a load for a long time with no complaint. That is the way a power plant ought to be.

*(Continued on page 32)*

# 5,000 Radio Service Men Needed Now!

The replacing of the old battery operated receivers with all-electric Radios has created a tremendous country-wide demand for expert Radio Service Men. Thousands of trained men are needed quick!

## 30 Days of R. T. A. Home Training

enables you to cash in on the great opportunity in Radio

**$40 to $100 a week Full Time**

**$3.00 an hour Spare Time**

Ever on the alert for new ways of helping our members make more money out of Radio, the Radio Training Association of America now offers ambitious men an intensified training course in Radio Service Work. By taking this training you can qualify for Radio Service Work in 30 days, earn $3.00 an hour and up, spare time; prepare yourself for full-time work paying $40 to $100 a week.

**We furnish you with all the equipment you need to become a RADIO Service Man!**

### More Positions Open Than There Are Trained Men to Fill Them

If you were qualified for Radio Service Work today, we could place you. We can't begin to fill the requests that pour in from great Radio organizations and dealers. Members wanting full time positions are being placed as soon as they qualify. 5,000 more men are needed *quick!* If you want to get into Radio, earn $3.00 an hour spare time or $40 to $100 a week full time, this R.T.A. training offers you the opportunity of a lifetime.

### Radio Service Work a Quick Route to the Big-Pay Radio Positions

Radio Service Work gives you the basic experience you need to qualify for the big $8,000, $10,000 to $25,000 a year Radio positions. Once you get this experience the whole range of rich opportunities in Radio lies open before you. Training in the Association, starting as Radio Service Man, is one of the quickest, most profitable ways of qualifying for rapid advancement. ¶ If you want to get out of small-pay, monotonous work and cash in on Radio quick, investigate this R.T.A. training and the rich money-making opportunities it opens up. No special education or electrical experience necessary. The will to succeed is all you need.

## Mail Coupon for No-Cost Training Offer

Cash in on Radio's latest opportunity! Enroll in the Association. For a limited time we will give to the ambitious man a No-Cost Membership which need not . . . should not . . . cost you a cent. But you must act quickly. Filling out coupon can enable you to cash in on Radio within 30 days, lift you out of the small-pay, no-opportunity rut, into a field where phenomenal earnings await the ambitious. You owe it to yourself to investigate. Fill out coupon NOW for details of No-Cost Membership.

**The Radio Training Association of America**
**4513 Ravenswood Ave., Dept. MM-7 Chicago, Ill.**

**The Radio Training Association of America**
**4513 Ravenswood Ave., Dept. MM-7**

Gentlemen: Please send me details of your No-Cost training offer by which I can qualify for Radio Service Work within 30 days. This does not obligate me in any way.

Name .....

Address .....

City ..... State .....

# Classified Advertisements

MONEY-MAKING OPPORTUNITIES IN TABLOID FORM

**Rates for classified ads, 15 cents per word per insertion, or 12 cents per word per insertion for six insertions. Minimum 10 words. Cash should accompany order. Closing date 20th of third month preceding date of issue. Address Classified Manager, Modern Mechanics Magazine, 33 East Wacker Drive, Chicago, Ill.**

### AIRPLANE BUILDERS

VARIOUS sizes Balsa, reeds, round wood, bamboo, propeller blank. A big bundle for 30c. Four for $1.00. Aero Shop, 3050 Hurlbut Ave., Detroit, Mich.

$175 will build our beautiful, Henderson powered, high speed, steel fuselage one place monoplane, plans $1.00. Literature 10c. Barney Snyder, Rochester, Ind.

### AVIATION

AMBITIOUS boys and young men! Aviation calls you! Learn airplane construction and repair by building your own plane. The most complete plans on the market. Four pages of easily understood blue prints. Instructions for building plane, $.50. Plans $4.00. Price list of parts on application. Independent Aircraft Co., 413 N. 2nd St., Lawrence, Kansas. Instructions free with plans.

SAILPLANES, wonderful performance, $425. Full scale plans, $2.50. Gliders, good trainers, light weight, $225. Plans, $1.50. Wing ready to cover, $100. Wing ribs, $29; with spars, $35. Tapered sailplane wing, $125, uncovered. Ribs, $40. Spruce stick, 2c ft. Descriptive literature, 10c. Arrogliders, Rochester, Ind.

LIGHT Plane motors; supplies; materials; boat plans. Everything aeronautical. Send dime for illustrated literature. Marsh & Cendt Aircraft Co., Colby, Wisconsin.

LATEST, best and up-to-date aviation books. Modern Aircraft, 900 pages, 500 engravings. Price $5.00. Everybody's Aviation Guide, 256 pages, 140 illustrations. Price $2.00. ABC of Aviation, 160 pages, 150 illustrations. Price $1.00. Modern Aviation Engines, 1000 pages, more than 1,000 engravings in two large volumes. Price $9.00 for the set. All books are written by Major Victor W. Page. Also the latest book on the subject of "Aerial Navigation and Meteorology," by Capt. Lewis A. Yancey, who made the famous flight from Old Orchard, Maine, to Rome, Italy; 150 pages, 102 illustrations. Price $4.00. You make no mistake in ordering any of these books as they are all standard works, and some are used in 200 schools for instruction purposes. Any of these books sent prepaid on receipt of price, or just send us a card ordering book desired, and you can pay postman the price of book and postal charges when book is delivered. We publish books on aviation, 150 different subjects, and will send catalog on request. Norman H. Henley Publishing Company, 2 West 45th St., New York. Dept. 37.

DESIGNERS booklet, gives sizes in % of, wing, fuselage, rudder, fin, stabilizer, flippers, length of fuselage, how to balance ship, relation of wing and horse power loading. What you must know to build a successful plane. Price 50c. Barney Snyder, Rochester, Indiana.

STUDY Airplane Engines, 30 lessons 50c each. Send for No. One. Sessions Aircraft, Waynesville, Ill.

MOTORCYCLE engines as such will not fly your light plane. A HEATH HENDERSON MOTOR has the low price factor of the motorcycle motor, yet the dependability of the best aircraft motor. Having been customized, flown and refined for six years it contains only 40% motorcycle parts. In its stamps or coin brings illustrated motor booklet describing the changes necessary to make an aircraft motor from your Henderson. Heath Aircraft Corp., 1721 Sedgwick St., Chicago, Ill.

A PROPELLER for your light plane or boat must be exactly right to meet the conditions involved. Heath engineers can give you the propeller that will make your machine a success. 4c in stamps or coin brings catalogue. Heath Aircraft Corp., 1727 Sedgwick St., Chicago, Ill.

AIR-COOLED Ford Conversion of aluminum alloy castings and pistons. Blueprints for Dura-Built Student Monoplane and Conversion. Send 10c for illustrated booklet. Dura-Built Aviation Co., 40 Perrine Ave., Pittsfield, Mass.

MORE hours of flying at less maintenance cost than any airplane in the world. That is why the HEATH PARASOL is America's most popular sport plane. Build it yourself at $799 or ready to fly at $975. 10c in stamps or coin brings large illustrated booklet, telling how you may get started on only an investment of $12.00. See our ad, page 43. Heath Aircraft Corp., 1727 Sedgwick St., Chicago, Ill.

### AGENTS WANTED

YOU can make big money in the Fuel Business. No capital or experience needed, credit given. Here is your chance to establish a permanent business of your own in your territory. We will furnish Free Sample Case and Free Samples for customers. Repeat orders every week. Ask now! Federal Pure Food Co., F2307 Archer, Chicago.

YOU are wanted to resilver mirrors at home. Profitable business plating autoparts, tableware, etc. Write Sprinkle, Plater, 850, Marion, Indiana.

SUCCEED with your own products. Make them yourself. Formulas, Processes, Trade Secrets. Expert Analytical Service. Catalog, circulars free. A. Thaxly Co., Washington, D. C.

NEW!—Rubber Soles. Cement on instantly. Dissolve in gasoline. Waterproof. Sells fast. Big Repeater. Test at my expense. Bestever Co., 215 Irving Park Station, Chicago.

GREATEST soap discovery of the age! Made from South Sea Island plants. Produces 2 and 3 times more lather. Sensational seller. Good for $10 profit a day. Wonderful repeater. Particulars free. Albert Mills, 5155 Monmouth, Cincinnati, O.

IF YOU can't make money with our instructions, trade secrets, formulas, business schemes, mail order plans, and money making propositions, we advise you to quit the business. Complete $1.00 prepaid. Southern Service, Box 914, Fort Worth, Texas.

16-FOOT Rowboat, easily made. Blueprint 30c. Wee-Shu-U Co., 31st Postal Office, Detroit, Mich.

STRANGE Battery Compound charges instantly. Eliminates old method. Gives new life and pep. Big profits. Gallon free. Lichtning Co., St. Paul, Minn.

66 MILES on 1 gallon. Wonderful new Moisture Gas Saver. All autos. 1 sent to introduce. Critchlow, 803-E3, Wheaton, Ill.

SENSATIONAL Seller! New Automatic Clothes Washer. No rubbing. No electricity. Retails $9.75. Storm Royalty Co., 3652 Enright, St. Louis, Mo.

FREE booklet describes 67 plans for making $20-$100 weekly in home or office business of your own. Elite Co., 844G, Elizabeth St., N. Y.

### AUTOMOBILES AND ACCESSORIES

AUTOMOBILE Specialties—Guaranteed formulas for all latest money makers Lowest prices. Lightning Electrolyte charges storage batteries instantly, $5.00. Write for free lists. Murphy, Chemist, Box N, Tujunga, Calif.

66 MILES on 1 gallon. Wonderful new Moisture Gas Saver. All autos. 1 sent to introduce. Critchlow, 803-E2, Wheaton, Ill.

### BOATS

ROWBOATS, Houseboats, Canoes easily made. Literature free. Wee-Shu-U Co., 31st Postal Office, Detroit, Mich.

### BUSINESS OPPORTUNITIES

SELL by mail! Start your own small business anywhere. Free folder tells how. No personal selling. Everything furnished. D. Horton, Metropolitan Bldg., Pueblo, Colo.

"SCHEMER" Subscribers Surely Succeed. One reports $30,000 from an Idea; another $25,000 from three Schemes; another $10,000 from one Formula. Subscribe yourself—make big money too. 32nd year; only $1.00, three months, 25c. Elvy Patterson, Pub., Alliance, Ohio.

SUCCEED with your own products. Make them yourself. Formulas, Processes, Trade Secrets. Expert Analytical Service. Catalog, circulars free. A. Thaxly Co., Washington, D. C.

MONEY wanted for making models and toys. Send one dollar for samples. fifty cents for price list. Ross Brumbaugh, Reedsville, W. Va.

AMATEUR Cartoonists, earn $25.00 week, spare time. Copying Cartoons for Advertisers. Twelve-month contracts. Three-M Syndicate, Argyle, Wis.

FIFTY successful mail-order promoters; sales plans. L. Home, 3949 Metropolitan, Chicago.

# Classified Advertisements

### BUSINESS OPPORTUNITIES

STARTLING Invention! Screw-Holding Screw Drivers! Remove, insert screws inaccessible places! Factories, garages, electricians, mechanics buy on sight! Sells $1.50; exclusive territory. FREE trial! Tedco, 1536 Water St., Boston.

MAKE 12 foot Rowboat. Blueprint, 50c. Wee-Sho-U Co., 31st Postal Office, Detroit, Mich.

66 MILES on 1 gallon. Wonderful new Moisture Gas Saver. All autos. 1 sent to introduce. Critchlow, 803-E1, Wheaton, Ill.

### CHALK TALKS

LAUGH producing program, $1.00. Catalog, 10c. Halda Art Service, Dept. 57, Oshkosh, Wis.

### CHEMICALS

"HANDBOOK for Chemical Experimenters." Hundreds of experiments. Illustrated 50c. Booklet of Experiments, 15c. Chemical price list, 5c. General Chemical Company, Box 397, Reading, Penna.

### DETECTIVES

DETECTIVES earn big money. Excellent opportunity. Experience unnecessary. Particulars free. Write, George Wagner, 2190-V Broadway, N. Y.

### DISTRICT MANAGERS

WANTED District Managers. Oldest Organization of its kind in Accident and Health Insurance. Write today for information. Dept. 21, Inter-State Business Men's Accident Ass'n, Des Moines, Iowa.

### DUPLICATING MACHINES

"EXCELLOGRAPH" Portable Rotary Stencil Printing Duplicators $39.00. Equipped. Terms, description, testimonials, printed samples. Write. Pittsburgh Typewriter Supply Co., Dept. 240 Pittsburgh, Pa.

### EDUCATIONAL

BECOME a landscape architect. Uncrowded profession; wonderful opportunity for money-making. Easily mastered by mail. Earn while you learn. Est. 1916. Write for details. American Landscape School, 99 Plymouth Bldg., Des Moines, Iowa.

### FARM LAND

OZARKS—20 acres poultry, fruit land $100, $5 monthly. Fishing, hunting, trapping. Hubbard, 227 Grossman Bldg., Kansas City, Kansas.

### FOR INVENTORS

INVENTOR'S Universal Educator; contains 900 mechanical movements; 50 Perpetual Motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price $1.00 postpaid in U.S.A. Address Dieterich Co., publishers, 602A, Ouray Building, Washington, D. C.

### FOR SALE

FOR SALE. Used bi-plane. Converted "T" Ford powered. Information on request. Independent Aircraft Co., Lawrence, Kansas.

### FORMULAS

ANY formula $1.00; absolutely guaranteed, or money refunded. Send for free lists. Davis Chemical Laboratories, 1311B East 84, Cleveland, Ohio.

FORMULAS—All kinds. Catalog free. Clover Laboratories, MM, Park Ridge, Illinois.

500 FORMULAS and Big Catalog 25c. Ideal Book Shop, DM, Park Ridge, Illinois.

### HYPNOTISM

HYPNOTIZE—"Practical Hypnotism" copy 25c. Dr. Lonk, MM-2945 North Ridgeway, Chicago.

### INVENTIONS WANTED

INVENTIONS WANTED—Royalties paid, ideas developed—sell manufacture and commercialize—models and drawings prepared. Urbano Company, 561 Howard Street, San Francisco, California, U. S. A.

INVENTIONS WANTED—Patented, Unpatented. If you have an idea for sale, write, Hartley, Box 928, Bangor, Maine.

### INVENTORS

INVENTIONS commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 582 Enright, St. Louis, Mo.

### MAGIC GOODS

200 TRICKS—Vanishing Ball, Color-changing Pack, Spinning an Egg, Non-burning Handkerchief, Automatic Rising Card, Fade-Away Coin, Changing Water into Milk to Water, Self-Lighting Match, Floating Sugar and 190 other mystifying tricks by Thurston, World's Master Magician. No elaborate equipment needed. Illustrated. Mystify your friends. Complete instructions, $1.00. Franklin Publishing Company, 800 North Clark Street, Dept. 331, Chicago.

LEARN MAGIC—Easy Lessons—Make Big Money—Become a real magician—Be the life of any party. Only 25c. First Lesson (Worth $2.00) 2nd Lesson now ready. (25c). Ladson Magician, M-2968 N. Ridgeway, Chicago.

### MALE HELP WANTED

STEAMSHIP POSITIONS—Europe, Orient, Good pay; Experience unnecessary; List of positions free. Box 292, Mount Vernon, N. Y.

### MODELS

MODEL steam engines, boilers, blowlamps, for miniature power boats, catalog 15c. Anton Bohaboy, 212 Price St., Rahway, New Jersey.

TRAPPERS—Eleven good box traps. Complete blueprints, 30c. Wee-Sho-U Co., 31st Postal Office, Detroit, Mich.

### MUSICAL

PLAY Piano by Ear. A Sound System. Particulars free. Dr. Quinn's Harmony Studio, Box 12A, Ottawa, Canada.

### OLD GOLD WANTED

CASH for false teeth, dental gold, discarded jewelry, platinum, diamonds, antiques. Send to Uhler, Station B, Brooklyn, N. Y.

### PERSONAL

VENTRILOQUISM by mail—small cost. 2c stamp brings particulars. Geo. W. Smith, Room S406, 125 N. Jefferson St., Peoria, Ill.

MAKE 12 foot Folding Rowboat, Blueprint 30c. Wee-Sho-U Co., 31st Postal Office, Detroit, Mich.

FREE! Herbalist Almanac. Contains over 500 herb medicine recipes for home use. Write for details. Bottanic, 145 W. 112th St., Chicago.

PRIVATE party will purchase patent or merit outright or on royalty. Box 402, Green Bay, Wisconsin.

### PATENT ATTORNEYS

INVENTIONS Patented; confidential advice; inventions developed—representative for Blair Tool and Machine Corp.; trademarks registered. Edward Gottlieb, Patent Attorney, 5 Beekman St., New York.

### PHONOGRAPHS

BUILD Phonographs. Parts catalog mailed for 10c. American Phonograph Co., 3604 Wesley, Berwyn, Ill.

### SALESMEN WANTED

NEW SPECIALTY—Sells every business. Four $15 sales daily pay $288 weekly. World's largest firms, Bell Telephone, Sears Roebuck, etc., use it. Smallest business needs it. Customer guaranteed cash return ten times price paid. Protected by $20,000,000 Surety Company. Repeats. No competition. Walker made $1,765 first month. F. E. Armstrong, Pres., 2019G, Mobile, Ala.

SELL 3A Garage door holders, simple, automatic, quickly installed. Interests garage owners, builders, everybody. Exclusive territory proposition. Knowlson-Stevenson Co., Dept. C., Ann Arbor, Mich.

MANUFACTURER and distributor of Shoes and Hosiery wants salesmen. Big money opportunity. No experience necessary. Cash investment. Consolidated Shoe System, Dept. C-61, Eau Claire, Wisc.

### STAMPS

CAYMAN ISLANDS—Astounding Packet from Cayman Islands. Thirty other unique, interesting, beautiful Distant Islands, (richly colored, unusual designs). Hurry! Rush! Get yours now! Free for 5c postage. Empire Stamp, Toronto, Canada.

STAMP Collection FREE to approval applicants. Contains Iceland, Hamburg, Confederate, Turkey, etc. 2c postage. Tatham Stamp Co., (D9), Mittineague, Mass.

100 Different French Colonial Stamps, 25c to approval applicants. Ohio Stamp Co., Box 249, Cleveland, Ohio.

200 Different Stamps 10 cents; big price lists; 60% discount approvals. Covert Stamp, M39 State, Rochester, New York.

### SONG WRITERS

SONG Poems Commercialized. Write, Beaver, D29-1257 Elm, Green Bay, Wisconsin.

SONG Poem Writers—"Real" proposition. Hibbeler, D 195 X, 2104 Keystone, Chicago.

### STAMP COLLECTING

50 Different Iceland, Hamburg, etc., 2c. 15 Confederate essays, 10c. Tatham Stamp Co., D9, Mittineague, Mass.

### ZEPPELINS AND BALLOONS

FLOATING Zeppelins, Message Balloons, make and sell them! Big demand, no canvassing. Instructions, 25c coin. Walston Co., W. Frankfort, Ill.

## Send This Straw Ballot to Andy

*(Continued from page 28)*

**Dick Chesebrough, Paterson, N. J., a Double-M fan, sent us this neat wash drawing of his Allegra.**

YOU fellows who have missed several of your favorite subjects lately are invited to air your grievances herewith. It all started this way. A fellow writes in to me and says he wants some Model Stuff. I told the eds and they said they were carrying all they could. Space was at a premium. Then another asked for tricks and puzzles. The eds told me to tell it to the wee people. So I got sore and got up a jack pot, and I'm putting it squarely up to you fellows: please fill out the enclosed ballot and mail it to me, Andy the Grease Monkey, MODERN MECHANICS, Editorial Offices, Robbinsdale, Minn. There's a good jack pot for me if my contentions go through, and I claim I know what you cookies like in a red blooded mag. Also there are a few side prizes and booby prizes, like a fur lined bathtub for the ed who told me to go fry. Well here goes—you do the work and I take the prize. Are you with me? Check those that you most would like to see.

| | |
|---|---|
| How-to-build articles | ☐ |
| Photos of new inventions | ☐ |
| Home Workshop stuff | ☐ |
| Boat building yarns | ☐ |
| Wood Turning | ☐ |
| Big News Scoops of things mechanical | ☐ |
| Magic | ☐ |
| Metal Craft | ☐ |
| Lathe and Model projects, engines, etc. | ☐ |
| Airplane Designs and how to builds | ☐ |
| Glider Material, stories, plans | ☐ |
| Airplane Model stuff | ☐ |
| Radio General Articles | ☐ |
| Beginner's radio kinks | ☐ |
| Scientific problems | ☐ |
| Newest Patents | ☐ |
| Handikinks | ☐ |
| Astronomy | ☐ |
| Camping Craft | ☐ |
| Science and Physics | ☐ |
| Amateur Electrician | ☐ |
| Chemistry | ☐ |
| Motor Mechanics | ☐ |

This'll tell the eds what I want to have told, and we'll announce at a later date just how the straw vote went. Thanks, men.

Here's a memo from the boss: "Andy—tell the Gang to make their letters shorter." All right, all right. Shorter and sweeter and more of 'em, Gang.

* * *

Radio fans who like MODERN MECHANICS will be glad to get wind of the article for next month, which is for a midget sending and receiving set you can use in cruisers or a light airplane, or in camp to get information through considerable distances. Sam Rabl designed her. Nuff sed.

* * *

Amateur Electrician is one of the most popular portions of the book, to judge by letters from readers. Say, how they can kick or praise!

*Allegra*, popular light outboard cabin cruiser which ran complete in May MODERN MECHANICS, can be purchased in blue print form from Phillip L. Rhodes, 103 Park Ave., New York, for five bucks, which is cheap. Write Phil—he has the tracings, and he'll do the needful for you.

* * *

The function of this hombre in writin' these words is to spill you a load of gossip you'd never hear anywhere else. And of course, I kind of pilot the book the way I think she should go, because I'm out where the young bucks of today congregate, and I hear what's hot before the eds do, even. That's how we know what to shoot you fellows.

**"Homme" Holmburg, of Wayzata, Minn., made himself a nice little marine engine out of the power head of an old Evinrude cast iron wonder. These little motors have no end of long life; this one drives a husky rowboat at 7 miles per hour.**

*(Continued on page 182)*

Only **$2.00** down

# BRAND NEW

## GENUINE *Model 3*

## *Lowest Price — Easiest Terms*

HERE'S your chance to own that *brand new* Genuine Model 3 Corona you've wanted—on the easiest terms ever offered—at LOWEST PRICE ever offered. Complete in every detail; back spacer, etc. *Manufacturer's Guarantee.* Recognized the world over as the **finest, strongest, sturdiest portable built.**

**S. Joveton writes: "It truly is a wonderful machine. I am very pleased with it and find it very simple to work although it is the first typewriter I have ever used."**

**F. J. Baroughs, Jr., writes: "I am very well pleased with your little Corona and I must say I do not know what I would really do without it. It works like a charm and has every convenience of a larger machine."**

**Don P. Pina, composer and pianist says: "Corona has helped me put my songs over and is still doing it. I find it just the thing for writing words to songs and for all correspondence to the profession."**

**Mrs. G. Bernstein says: "Allow me to thank you for prompt delivery of the Corona. I am delighted with it and know I shall derive great pleasure from its possession."**

Try this wonderful portable typewriter—the same machine that has satisfied 500,000 users. Experience the joy this personal writing portable typewriter can give you! Use it ten days free! See how easy it is to run and the splendidly typed letters it turns out. Ideal for the office desk, home, traveling. Small, compact, light, convenient. Don't send out letters, manuscripts, reports, bills in poor handwriting when you can have this Corona at such a low price on such easy terms. Remember these are *brand new* machines right out of the Corona factory.

### Carrying Case Included

*If You Act Now!*

Leatheroid carrying case, oiler, instructions free on this offer. - Send no money—just the coupon. Without delay or red tape we will send you the Corona. Try it 10 days. If you decide to keep it, send us only $2—then $3 a month until our special price of $39.90 is paid. Now is the time to buy. Mail coupon today!

### *Save Money—Use this Coupon*

**Smith Typewriter Sales Corp., (Corona Division)**
**469 E. Ohio St., Chicago, Ill. Dept. 177**

Ship me the Corona, F. O. B. Chicago. On arrival I'll deposit $2 with express agent. If I keep the machine I'll send you $3 a month until the $37.90 balance of $39.90 price is paid; the title to remain with you until then. I am to have 10 days to try the typewriter. If I decide not to keep it, I will repack and return to express agent and get my money back. You are to give your standard guarantee.

*Name* .....

*Address* .....

*Employed by* .....

# Mechanical Engineering

## *Learn at Home*

MECHANICAL Engineering embraces the design, construction and operation of machines and machine tools. It is a profession which offers almost unlimited opportunities to men who combine natural mechanical ability with technical training.

For this is The Age of Machinery. Almost every convenience, luxury or necessity which we enjoy depends on machinery for its production or adaptability to our needs. Every new invention multiplies the opportunities for competent designers, builders, erecting engineers, etc.

One of the best ways to train yourself to secure a position as a Mechanical Engineer is through the home-study courses of the International Correspondence Schools.

These courses are complete and up-to-date, and especially arranged to meet the needs of the student who studies at home.

They are particularly helpful because they are written by well-known mechanical engineers with years of practical experience, who know the quickest, best way to solve every problem.

Just mark and mail the coupon and we'll gladly send you Free Booklets describing the I. C. S. courses in Mechanical Engineering or any other course in which you are interested.

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 2325-E, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course before which I have marked X in the list below:

| | |
|---|---|
| ☐ Mechanical Engineering | ☐ Toolmaking |
| ☐ Mechanical Course | ☐ Blacksmithing and Forging |
| ☐ Drafting | ☐ Patternmaking |
| ☐ Mechanical Drawing | ☐ Foundrywork |
| ☐ Complete Shop Practice | ☐ Machine Shop Practice |
| ☐ Architect | ☐ Plumber and Steam Fitter |
| ☐ Architectural Draftsman | ☐ Plumbing Inspector |
| ☐ Building Foreman | ☐ Foreman Plumber |
| ☐ Concrete Builder | ☐ Heating and Ventilation |
| ☐ Contractor and Builder | ☐ Sheet-Metal Worker |
| ☐ Structural Draftsman | ☐ Steam Engineer |
| ☐ Structural Engineer | ☐ Marine Engineer |
| ☐ Electrical Engineer | ☐ Refrigeration Engineer |
| ☐ Electrical Contractor | ☐ R. R. Position |
| ☐ Electric Wiring | ☐ Highway Engineer |
| ☐ Electric Lighting | ☐ Chemistry ☐ Pharmacy |
| ☐ Electric Car Running | ☐ Mining Engineer |
| ☐ Telegraph Engineer | ☐ Navigation ☐ Assayer |
| ☐ Telephone Work | ☐ Iron and Steel Worker |
| ☐ Civil Engineer | ☐ Textile Overseer or Supt. |
| ☐ Surveying and Mapping | ☐ Cotton Manufacturing |
| ☐ Bridge Engineer | ☐ Woolen Manufacturing |
| ☐ Gas Engine Operating | ☐ Agriculture ☐ Fruit Growing |
| ☐ Automobile Work | ☐ Poultry Farming |
| ☐ Aviation Engines | ☐ Mathematics ☐ Radio |

BUSINESS TRAINING COURSES

| | |
|---|---|
| ☐ Business Management | ☐ Business Correspondence |
| ☐ Industrial Management | ☐ Show Card and Sign Lettering |
| ☐ Personnel Management | ☐ Stenography and Typing |
| ☐ Traffic Management | ☐ English |
| ☐ Accounting and C. P. A. Coaching | ☐ Civil Service |
| | ☐ Railway Mail Clerk |
| ☐ Cost Accounting | ☐ Mail Carrier |
| ☐ Bookkeeping | ☐ Grade School Subjects |
| ☐ Spanish ☐ French | ☐ High School Subjects |
| ☐ Salesmanship | ☐ Cartooning |
| ☐ Advertising | ☐ Illustrating |

Name .....

Address .....

City ..... State .....

Occupation .....

*If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada*

# What Made His Hair Grow?

## Read HIS LETTER for the ANSWER

Mr. H. A. Wild, whose photograph appears at the left, is among those who are knowledge complete satisfaction from the use of Kotalko.

"Now hair came almost immediately after I began using Kotalko," he writes, "and kept on growing. In a short time I had a splendid head of hair, which has been perfect ever since."

This statement by Mr. Wild is but one of the many which voluntarily attest that Kotalko has stopped falling hair, eliminated dandruff, added new, luxuriant hair growth where the roots were alive.

Hair roots that remain in the scalp long after the active hairs are lost, may retain their original power through proper encouragement. The process of hair growth depends on the hair roots and the nourishment they receive.

**Women** also report new hair growth through KOTALKO. Many testimonials from men and women whose health was undoubtedly good and whose hair roots were not dead.

**Is your physical condition** equal to theirs? And are your hair roots alive but dormant? If so, they may be stimulated into growing hair through Kotalko, the right sort of invigorant. **Sold by busy druggists.**

**Free Box** To prove the efficacy of Kotalko for men's, women's and children's hair, the producers are glad to mail a trial package FREE. Use coupon. Liberal Proof Below.

KOTAL CO., D-674, Station O, NEW YORK

Please send me FREE Proof Box of KOTALKO.

Name .....

Full Address .....

**Social popularity; warm friends; extra money for spare-time play, with a chance for fame and fortune! All yours, when you learn to play a**

BUESCHER True-Tone Saxophone

**EASY TO PLAY** Master scales in one hour; easy tunes first week; join a band in 2 to 3 months. FREE LESSONS give quick, easy start. Fun from the very beginning. Success assured with a Buescher.

**EASY TO PAY** Take 6 days free trial on any Buescher instrument. See what you can do. EASY TERMS. Play as you pay. Send coupon today for beautiful catalog. Do it right now.

**Buescher Band Instrument Co.**
715 Buescher Block, Elkhart, Ind.

*Gentlemen:* Without obligating me, please send catalog of

☐ Saxophones ☐ Trumpets ☐ Trombones

Mention any other .....

*I now play a* ..... *My age is* .....

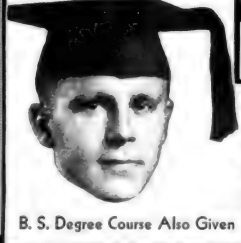
*Name* .....

*Street Address* .....

*Town* ..... *State* .....

NATURAL APTITUDE
FORESIGHT - INDUSTRY

NATIVE INTELLIGENCE
DETERMINATION - ZEAL



B. S. Degree Course Also Given

# Step up Young Man and Get Measured for this NEW PROFESSION

*A distinct new calling that requires men of the engineering and executive type. Young men who have a natural liking for mechanics and electricity and who also aspire to the big earnings and pleasant life of the successful business man. Young men who combine the practical application of sound business training and skillful technical knowledge.*

*To satisfy the demands of industrial leaders, this School is conducting a world wide search for 1,000 or more young men of this type to prepare for this great new profession. Each will be given an Aptitude Test without cost. A few of them will be given FREE Scholarships. Those chosen will have the doors of opportunity in America's greatest enterprises thrown wide open to them!*

# COMMERCIAL ELECTRICAL ENGINEERING

## A New Calling of Boundless Opportunity for Big Income and Power

A new group of men who are today capturing the good jobs in the business world. Keen young fellows of the student type who buckle down and tear in with horse sense and trained knowledge to rise above the baffling, lazy fellows with nothing more than nerve and personality to recommend them.

Capital has become "hard boiled." It demands men who know the principles and practices involved and how to practically apply them to the problems of business and commerce. This situation has created a sweeping, urgent demand for men with engineering training and especially electrical engineering, since this force is the most compelling in modern industrial life.

A new profession—one that will satisfy the most ambitious fellow—one that will bring him opportunity for earnings that will make him a leader among men—a power in his community and civic affairs.

### 1 Year of Training

To get a footing in this new, fascinating, richly-paid profession requires but one year of intensive, interesting, easy training. If necessary, you can also secure 3 months' training to get into immediate earnings.

### Millionaire at 401

H. L. C.—engineering diploma man, from his training quickly through a definite program to the millionaire class before 40.

D. S.—engineer—business man heads ten million dollar concern while yet around 40.

The big prizes are going to the engineer-trained business men today!

### Home Training

If so desired, candidates for this profession may begin their training at home and finish here when time and other considerations make it possible.

### Aptitude Test —FREE

Mailing the coupon will bring you an Aptitude Test Sheet, the filling out of which will give us a basis to determine your fitness. No charge is made for this test—conducted by able vocational experts and industrialists.

### FREE Scholarships

A limited number of men who show outstanding merit and fitness for this great new profession will be given a 3-Months' Free Scholarship at this great internationally known institution of practical, successful training. The coupon will bring full details of this amazing offer.

### RADIO

Those whose inclination runs to Radio should request the special Aptitude Test Sheet for Commercial Radio Engineering. Radio is on the verge of sensational expansion and offers limitless opportunity to the young man of ambition and diligence.

### Be Quick!

Enter the contest for Free Tests and Scholarships now, before this campaign is brought to a close. Don't procrastinate and let the prizes go to some other fellow. If you are 35 or less, if you've got good character, normal intelligence, and plenty of backbone, you'll make the grade! Send the coupon now!

**SCHOOL of ENGINEERING of Milwaukee**
163 E. Wells St., Dept. 40-A
Milwaukee, Wisconsin

**REQUEST FOR APTITUDE TEST**

**School of Engineering of Milwaukee, Dept. 40-A**
**Milwaukee, Wisconsin.**

Without obligation, please send me, free, Aptitude Test for:

☐ Commercial Electrical Engineering.
☐ Commercial Radio Engineering.

Name.....

Address.....

City..... State.....

☐ I will consider a 3 months' intensive training course.
☐ I can't leave home, but want to get started Immediately. Tell me about your special plan.

# Learn All About AUTOS

## 6 BIG AUTO BOOKS *All Shipped* FREE

ON APPROVAL

Whether you want to qualify as garage owner, auto repair expert or merely wish to know how to keep your own car 100% efficient, look at these books—they are sent to you for free examination. This brand new **1930** edition has been prepared by a large group of America's greatest automotive engineers. Anybody who can read will understand them, for this great automobile cyclopedia is a veritable gold mine of valuable facts. Take advantage of this great opportunity now; send in the coupon for FREE examination. You don't pay us a penny, you don't obligate yourself to pay anything unless you decide to keep the books. Just tell us you want to see them and the **full set** of 6 great volumes, just off the press, will be sent to you.

## New 1930 Edition

Imagine books which are so new that every page is right up to date—wiring diagrams, construction details, service problems—are all right up to the minute. Nowhere else that we know of can you get as complete and up to date information. Over a million dollars of resources have enabled us to give you the most up to date books on the subject ever published. You will find nearly 20 pages on front wheel drives alone. Everybody interested in automobiles in any way will welcome these books, especially on our

**AVIATION MOTORS**

In addition to being a complete cyclopedia of automobile engineering, these books contain over 100 pages on Aviation Motors, and as they are just off the press they bring to you the newest and latest information obtainable. This alone makes these books invaluable to anyone.

## No Money Offer

This plan brings this valuable information within the reach of everyone. You don't send us a single penny; you don't have to pay us anything; just send your name and address and we will send you the complete set of 6 volumes specially bound in De Luxe Flexo covers.

## Send No Money—Just the Coupon

**American Technical Society, Dept. A-B320,**
**Drexel Ave. at 58th Street,**
**Chicago, Illinois.**

I would like to see the new 6 volume 1930 edition of your automobile books but without any obligation to buy. I will pay the few cents delivery charges only and will examine the books and return them at your expense in 10 days unless I like them, in which case I will send you $2.00 then and only $3.00 per month until the special price of only $24.80 is paid. You are to include free, consulting membership certificate in American Technical Society. Send brand new 1930 edition.

Name.....

Street.....

City.....State.....

Employer's Name.....

Employer's Address.....

## NOW YOU CAN BUILD YOUR OWN

### Model Gas Engine For Model Airplanes and Speed Boats

We furnish all the castings and detailed drawings.

You do the machining and assembling.

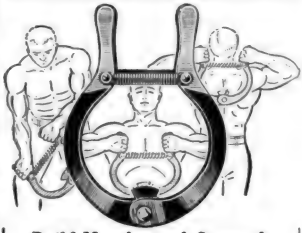
The Junior
Two-cycle, air-cooled, Duplex Manifold.
Weighs only 2 pounds.
May also be had in water-cooled.

The Question Mark
Four-cycle, air-cooled, overhead valves.
Send 5c coin for circular about Wall Castings for Model Gas Engines

*"For the Best of Them All, Build a Wall"*

**ELMER WALL**

**5900 N. Fairfield Avenue** **Chicago, Illinois**



## Build Muscles and Strength With This Iron Shoe

The Germans invented the iron shoe because they realized it enabled them to achieve physical perfection. We have brought it to America and improved it. It is offered to you at a ridiculously low price. Every strong man uses one to build back muscles, tremendous chest and powerful giant-like arms. We show how to develop abdomen and legs so that you will be a top-notcher in thirty days. We don't just ship this apparatus and let you work out your muscle-building problems for yourself—we include a sixty-day course absolutely free, thereby making this the greatest body-developing offer presented to you in a lifetime. Write for full particulars today and start getting strong at once.

### 14 Day Trial Offer

So positive are we that you will say the iron shoe is the greatest piece of muscle-building apparatus you ever saw that we ship it to you on 14 days' free trial. Sign your name to the coupon below and rush it to us and receive full particulars about this special offer by return mail. There is no obligation for this information—it is free. We reserve one of our free sixty-day courses for those who write at once.

**American Athletic Appliance Co.**
**3817 N. 9th St., Dept. MM-7**
**Philadelphia, Pa.**

Without any obligation on my part and without cost, send full particulars about your iron shoe and your fourteen-day trial offer. Also reserve a free sixty-day course for me.

Name.....

Address.....

# Why good dancers are popular

**Good dancers are good mixers. They create a favorable impression—have ease of manner, a pleasing assurance that wins. No wonder people find them interesting—seek their company!**

By ARTHUR MURRAY,
*World-Famous Dancing Authority*

GOOD dancers are popular—sure of a good time wherever they go!

And dancing is great fun—wonderful exercise. Keeps you happy and healthy — on your toes and full of pep. Develops self-confidence, poise. Enables you to make friends easily—to be well-liked—and often opens the doors to important business and social contacts.

And it's so easy now to be a good dancer, able to do all the newest, smartest steps! It's so easy now to get some real fun out of life—to be a good mixer —to be popular, sought after, admired!

*Posed by Jean Arthur, Famous Film Star, and Arthur Murray*

## Amazing New Method

I have developed a remarkable new method which is so simple that *you can learn any of the latest steps in one evening*—right at home, in the privacy of your own room, without music or partner!

It makes no difference if you've never been on a dance floor in your life—my new method makes learning to dance *just as easy as taking one step after another!*

With my amazingly simple lessons you start right at the beginning and go through the entire field of social dancing. Nothing is omitted—nothing taken for granted. You learn to master every step from the simple waltz to the newest, smartest steps and all their variations.

### If You Can Do This Step

**Arthur Murray will make you a finished dancer in 10 days.**

## Learn at Home Without Music or Partner

The best feature of my easy lessons is that you study them in the comfort of your own home whenever you find time. No one to watch and embarrass you. No private teacher—no partner—no music—just the lessons. Yet, almost before you realize it, you will be able to step on the floor with the best dancers of your set—and with as much ease and assurance as if you had been dancing for years!

## *Regular $5.00 Course NOW ONLY $1.98*

**Five Days Free Trial**

I have already taught over 400,000 men and women how to dance through this amazingly simple method. Thousands of folks everywhere who used to stay home and miss all the fun are now having the time of their lives.

And I'm so positive that you, too, can become a good dancer and get your full share of fun and popularity through my new, easy method that I'm willing to send you my *regular $5.00 course for only $1.98!*

Just mail the coupon below, and the regular $5.00 course will be sent you immediately. When it arrives, pay the postman only $1.98, plus few cents delivery charges. Then use it for five days—study it—practice the steps. See for yourself how easy it is to become a finished dancer—sought after, popular—the Arthur Murray way.

Remember—if you're not absolutely delighted with results, simply return the course within the five days FREE trial period, and *your money will be promptly refunded.* Arthur Murray, Studio 134, 7 East 43rd St., New York.

**ARTHUR MURRAY, Studio 134,**
**7 East 43rd St., New York City.**

To prove that I can learn to dance at home without music, partner, or teacher, you may send me your regular $5.00 course for only $1.98 C.O.D. I understand that if not delighted I may return the course within 5 days and my money will be refunded.

Name .....

Address .....

City ..... State .....

NOTE: If not to be out when postman calls, send $2.00 with coupon and save C. O. D. postage.

# Let RCA Institutes Start You on the road to SUCCESS in RADIO

RADIO needs you . . . That's why the entire Radio industry is calling for trained men . . . That's why thousands of men who answered these advertisements are now earning from $2,000 and up a year. Manufacturers, broadcasting stations, aviation and radio are now eagerly seeking trained RCA Institutes men . . . Never before was there an opportunity like this in Radio.

*Radio Mechanic and Inspector, $1800 to $4000 a Year.*

*This Is the Only Course Sponsored by the Radio Corporation of America*

The RCA Institutes' Home Laboratory Training Course enables you to learn Radio in your spare time. In only an hour a day, you can obtain a thorough, practical education in Radio . . . You study right at RCA, the world's largest Radio organization. You learn Radio by actual experience with the remarkable outlay of apparatus given to every student. That's why every graduate of RCA Institutes has the experience, the ability and the confidence to hold a worthwhile Radio job.

*Broadcast Operators $1800 to $4800 a Year.*

*Graduates of RCA Institutes Find It Easier to Get Good Jobs*

SEND FOR THIS FREE BOOK . . . Read about these practical RCA methods of training that have prepared hundreds of men for success in Radio. Everything you want to know about the opportunities in radio. Forty fascinating pages, packed with pictures and descriptions of the brilliant opportunities in this world-wide profession. RCA Institutes will back you up to the limit. Our catalogue is yours, free . . . SEND FOR IT TODAY!

## RCA INSTITUTES, INC.

A Division of the
Radio Corporation of America

*Clip this Coupon Now!*

RCA Institutes, Inc., Dept. X M7
75 Varick St., New York, N. Y.

Gentlemen: Please send me your FREE 40-page book which illustrates the brilliant opportunities in Radio and describes your laboratory-method of instruction at home!

Name .....
Address .....
State .....

# RUPTURE IS NOT A TEAR

Your physician will tell you that hernia (rupture) is a muscular weakness in the abdominal wall. Do not be satisfied with merely bracing these weakened muscles, with your condition probably growing worse every day!—Strike at the real cause of the trouble, and

**WHEN—**

The weakened muscles recover their strength and elasticity, and—

The unsightly, unnatural protrusion disappears, and—

You recover your vim, vigor and vitality,—your strength and energy,—and you look and feel better in every way,—and your friends notice the difference,—

**THEN—**

You'll know your rupture is gone, and

You'll know why for almost a quarter of a century numerous sworn statements report complete recovery and freedom from uncomfortable mechanical supports, without delay from work.

## SEND NO MONEY

A test of the scientific self-treatment mentioned in coupon below is now available to you, whether you are young or old—man or woman. It costs you nothing to make this test.—For your own good mail the coupon NOW—TODAY.

**FREE TEST COUPON**
**PLAPAO LABORATORIES, Inc.**
**450 Stuart Bldg., St. Louis, Mo.**

Send me a Free 10 day test supply of the remedial factor Plapao and 48-page illustrated book on Rupture; no charge for this now or later.

Name .....
Address .....

# AVIATION Information FREE

Send us your name and address for full information regarding the Aviation and Airplane business. Find out about the many great opportunities now open and how we prepare you at home, during spare time, to qualify. Our new book "Opportunities in the Airplane Industry" also sent free if you answer at once.

AMERICAN SCHOOL OF AVIATION
Dept. 205-B 3601 Michigan Ave. CHICAGO

# Learn to Dance

## This New Easy Way

You can learn all the modern dances—Charleston, Black Bottom, Valencia, Lancer, French Tango, St. Louis Hop, Latest Waltzes, Fox Trots, etc., at home easily and quickly. New short method makes dancing as simple as A-B-C. No music or partner needed. Big success everywhere. Low cost. Now popularity for in demand at parties. Same course of lessons would cost $50 if taken privately.

## Send No Money

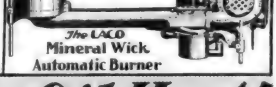
Just send your name and address. We'll ship the complete course—852 pages, 49 illustrations—without one cost in advance. When package arrives, hand postman only $2.98 (plus few cents postage) for complete course. Try for 5 days. Money back if not delighted. Send your name NOW.

**FRANKLIN PUB. CO. 800 N. Clark St. Dep. A395 Chicago**

# WORLD'S LOWEST PRICE
## Automatic Power Oil Burners

# Revolutionize Oil Heat!

## New Ways of Burning Oil CUT FUEL COSTS to a Mere Fraction!




NOW—at last—OIL HEAT really challenges coal. The LACO—FORD of the oil burners, makes it possible. INDUSTRIAL USERS of coal—firms of every kind—who MUST have dependable, EVEN heat—but must also save every penny—are now installing the LACO all through their plants. Owners of office buildings, merchants, home owners, are delighted! The news is spreading like wildfire. Our sales last year were in the MILLIONS! That tells its own story about the PATENTED MINERAL WICK BURNERS THAT BURN AIR WITH OIL, for the first time eliminating waste of oil, eliminating soot, smoke, grease—and SMASHING FUEL COSTS so low that it doesn't pay ANYONE to undergo the drudgery of coal any more!

## The New LACO Model "F" for the Heavier Oils

Now—the world's lowest price atomizing power burner—LACO MODEL F—for communities where the heavier fuel oils are offered. Fully automatic. NEW PRINCIPLE results in big fuel savings. Operates under LOW pressure instead of high pressure. Flame does not shoot across and burn out fire brick opposite. Instead, a slow, lazy current of air, moving in a spiral direction, picks up the finely atomised oil, ignition follows, and a clear, yellow flame, burning lazily UPWARD, results. Every particle of the oil is caught and BURNED—waste, soot, carbon, smoke eliminated. Burns so QUIETLY, the average person's ear CANNOT detect the sound at all! Equipped with automatic safety-lock-out system, stack-switch. Safety absolutely controlled. Only one moving part—rubber cushioned to prevent vibration. Finished in beautifully colored modernistic designs. The simplest burner of its kind in the world. Heats your home at a cost so low that it just doesn't pay to use coal any more. Get full information on this burner. Write for sensational low price now.

## Fits Any Furnace or Stove....No Bricking

**DEALERS . . WRITE FOR MOST AMAZING PROPOSITION OFFERED ON OIL BURNERS**

A new heating system unnecessary. Installs easily in few minutes right into any hot-air, hot-water, steam or vapor-heat system—any range, stove, or parlor heater.

The Laco complies with all ordinances. Lasts a lifetime. Automatic control of safety—safer than ordinary kitchen range. Quiet. A marvel of economy and heating efficiency.

### LACO JUNIOR
**for Small Furnaces, Heaters, Stoves**

Fits small furnaces for homes of five to eight rooms. Installs in Arcolas, Heatrolas, parlor stoves, hot water heaters—in fact, any small coal burning heater. Uses less oil than any burner on the market today. Write for full information. Sensational low price.

### The Cook Stove Burner

gives you the convenience and clean heat equal to CITY GAS but at a MERE FRACTION OF THE COST, something you never before dreamed possible. Safer than gas as you can leave it on indefinitely and nothing happens. Get our sensational prices and full information.

## Install Now — Payments Later

The smallest down payment—easiest terms. Special proposition if you order now.

## Write for Sensational Low Price Offer

Please state kind of heating plant you now have, and size of home or building you want to heat. Get the facts about this amazing new burner which you can buy at a fraction of the cost of other burners. Write for full information now.

**LACO OIL BURNER CO. Dept. 2011 Union St., Griswold, Iowa**

# FIT YOURSELF AT HOME for A BIG-PAY JOB in ELECTRIC REFRIGERATION

EARN $50 TO $125 A WEEK!

Be the first in your locality to get into America's new magic industry—Electric Refrigeration. Trained experts needed in every town and neighborhood. You can easily qualify at home to install, service and repair electric refrigerators. Clean, fascinating work and pays big because trained men are scarce. You will visit the better homes and merchants in your vicinity; drive a car with expenses paid. Perhaps you'll have your own business as the local service station for distant manufacturers. U. E. I. training, a few tools and some business cards get you going. Splendid opportunity for salesmen.

Come into Electric Refrigeration—the fastest growing money making industry! That's what General Motors, General Electric and other money powers did! They invested millions and now they need men like you with proper training. Here is your chance to get in on the ground floor and escape forever from poor pay, unemployment and limited future.

## Now Easy to Learn at Home in Your Spare Time

THIS amazing, new, simplified method of training prepares you quickly at home, in spare time, for big pay positions open only to trained men. Unlike ordinary schooling. No textbooks. No study drudgery. Fascinating lessons—charts, diagrams, pictures and practical problems teach you every principle and practice. Experts guide you, step by step. Free employment service. Easy terms. Money-back agreement.

Highly endorsed by General Electric, Hertzel, Kelvinator, Copeland, Zerozone and others. Hundreds of satisfied students. Coupon below brings full facts and free proof. Mail it today!

**Utilities Engineering Institute**
**4403 Sheridan Rd., Dept. 670, Chicago, Ill.**

**FREE** You should have our new valuable book of facts about Electric Refrigeration. Sent without cost or obligation—simply mail coupon NOW!

*Dealers:* We are referring our graduates to you as fast as they graduate. Please write us your requirements as early as possible for choice selection.

*"My salary has been increased 15% since I enrolled," writes S. C. Mathias, Pa.*

*O. Born, Ill., says: "Altho I am only half thru with my training, I have been called on to make adjustments on refrigerators."*

Utilities Engineering Institute,
4403 Sheridan Rd., Dept. 670,
Chicago, Ill.

Send me without cost or obligation your big book, *Rick Rewards In Electric Refrigeration* and details about your home training.

Name .....

Address .....

City ..... State.....

# PATENTS

## Protect Your Ideas

*Write for Instructions, free on request - - or send drawing or model for preliminary examination of Patent Office records*

**Promptness Assured with Best Results**

+++

**MILLER & MILLER**
**PATENT ATTORNEYS**
FORMER MEMBERS EXAMINING CORPS, U. S. PATENT OFFICE
263 McGILL BUILDING, WASHINGTON, D. C.

## *Build and Fly this* New Ideal "CONDOR"

**Plans for Model Airplanes 25c each**

Floyd Bennett Monoplane
PARKER MONOPLANE
New York-Paris Plane
Curtiss Biplane
Bellanca Biplane
NC 4 Naval Seaplane
Bleriot or Nieuport Monoplanes
Cecil Peoli Racer

The latest idea in Featherweight Models; 22 in. size and weights only ¾ oz. Simplified, advanced design; all Balsawood construction; adjustable wings; adequate power for long flights; interchangeable landing gear; easy, quick construction. Get the CONDOR —Construction Set. Ask your Dealer, or Order Direct. **$1.** (Postage 15 cents extra)

Catalog of Parts, Fittings, Supplies for Model Builders, 5c

IDEAL AEROPLANE & SUPPLY CO., Inc.
26 - 28 West 19th Street New York

# HOLD ON! CAN YOU?

Is your grip as strong as the rest of your body? Our heavy tension exerciser, now at the unheard of price of $1.00, gives you an unbreakable grip of steel while you build up your chest and shoulders. Don't neglect that important part of your physical development. Build a mighty arm and a crushing grip. Send today . . . this offer won't last forever. Money back if 5 days not satisfied with this speedy, convenient exerciser. Write now, before you forget it.

**$1.00** **$1.00**

GIBRALTAR EXERCISER CO., Dept. 1207
25 West 54th Street New York City

# Money Making Tools

**Sent to YOU**

**Become a BIG PAY MAN with My Help**

COMPLETE OUTFIT

ALSO DRAFTING TABLE

**ALL are Regular Draftsman's Tools SENT AT ONCE**

**EARN AS YOU LEARN**

Thrill you both in start learning easy money a low work-after-beginning pay learning.

*Copy me and get Iearine Rule Free.---Jack*

## Copy this Jack and Get this Draftsman's Rule FREE

Automobiles—Electricity—Motor Buses—Aviation—Building Construction. There are jobs for Draftsmen in all of these industries and in hundreds of others. Aviation is expanding to enormous proportions. Electricity is getting bigger every day. Motor Bus Building is becoming a leading world industry. Building of stores, homes, factories and office buildings is going on all the time. No structure can be erected without plans drawn by a draftsman. No machinery can be built without plans drawn by a draftsman.

I train you at home, in Drafting. Keep the job you have now while learning drafting. I will train you in drafting right where you are in your spare time. I have trained men who are making from $5,000 to $9,000 a year. There is a big future for draft-men because you plan and supervise the work of others, or you go into business for yourself. Get started now toward a better position, paying a good, straight salary, the year around. Comfortable surroundings. Inside work.

**Employment Service** After training you I help you to get a job without charging you a cent for this service. Employers of Draftsmen come to me for men because they know that Dobe Trained Men make good as they have learned drafting by actually doing the work themselves, in a practical way. Employers know they are not taking chances on men trained by me.

**Money-Back Agreement**

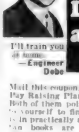
I train you at home under a positive Money-Back Agreement. If my training does not satisfy you after you have finished, you get every penny back.

**Age or Lack of Education No Drawback**

Previous experience is not necessary. You do not need to be a college man or high school graduate.

## Get My Pay-Raising Plan —also FREE

*If you will mail sketch at once I'll send you also FREE "My Pay-Raising Plan"*



I'll train you at home. —Engineer Dobe

## If You Earn Less Than $70 a Week—Write Me Today!

## MONEY-MAKING TOOLS COUPON

**ENGINEER DOBE, 1951 Lawrence Ave., Div. B-235 Chicago**

Here's my copy of Jack. Send me free of all cost your book, "Successful Draftsmanship", also plan of earn money while learning and proof of big money paying positions. Also your text book "My Pay-Raising Plan." Also tell me about your Money-Making Tools which you furnish. Send the free Pocket Rule.

Name ..... Age .....

Address .....

Post Office ..... State .....

Mail this coupon, at once with copy of Jack. Get "My Pay Raising Plan" and "Successful Draftsmanship". Both of them point the way to Success. You owe it to yourself to find out what a big opportunity there is in practically all industries, for Draftsmen. These fine books are Free. They come to you postpaid. Mail the Coupon for them TODAY.

**Engineer Dobe**

**1951 Lawrence Ave., Div. B-235, Chicago**

Go to School at Home!

# High School Course in Two Years!

## You Want to Earn Big Money!

**And you will not be satisfied unless you earn steady promotion.** But are you prepared for the job ahead of you? Do you measure up to the standard that insures success? For a more responsible position a fairly good education is necessary. To write a sensible business letter, to prepare estimates, to figure cost and to compute interest, you must have a certain amount of preparation. All this you must be able to do before you will earn promotion.

Many business houses hire no men whose general knowledge is not equal to a high school course. Why? Because big business refuses to burden itself with men who are barred from promotion by the lack of elementary education.

## Can You Qualify for a Better Position

We have a plan whereby you can. We can give you a complete but simplified high school course in two years, giving you all the essentials that form the foundation of practical business. It will prepare you to hold your own where competition is keen and exacting. Don't doubt your ability, but make up your mind to it and you will soon have the requirements that will bring you success and big money. YOU CAN DO IT.

Let us show you how to get on the road to success. It will not cost you a single working hour. Write today. It costs you nothing but a stamp.

**American School**

Dept. HB-33 Drexel Ave. and 58th St., Chicago

**American School**

**Dept. HB-33 Drexel Ave. and 58th St., Chicago**

Send me full information on the subject checked and how you will help me win success.

| | |
|---|---|
| ....Architect | ....Business Law |
| ....Building Contractor | ....Lawyer |
| ....Automobile Engineer | ....Machine Shop Practice |
| ....Automobile Repairman | ....Mechanical Engineer |
| ....Civil Engineer | ....Shop Superintendent |
| ....Structural Engineer | ....Employment Manager |
| ....Business Manager | ....Steam Engineer |
| ....Cert. Public Accountant | ....Foremanship |
| ....Accountant and Auditor | ....Sanitary Engineer |
| ....Bookkeeper | ....Surveyor (& Mapping) |
| ....Draftsman and Designer | ....Telephone Engineer |
| ....Electrical Engineer | ....Telegraph Engineer |
| ....Electric Light & Power | ....High School Graduate |
| ....General Education | ....Wireless Radio |
| ....Vocational Guidance | ....Undecided |

Name.....

Address.....

.....

# NEW LOW PRICES

ON GOODYEAR Firestone FISK AND OTHER U.S. TIRES

**Lowest Prices in History!** The big company, because of its immense buying power, will supply you with reconstructed standard make tires at these unheard of low prices—the whole year's service guaranteed. Thousands of satisfied customers rounds your after year. **Dealers Wanted.**

**ORDER NOW - SAVE MONEY**

| BALLOON Tires Size | Rim | Tires | Tubes | Reg. CORD Tires Size | Tires | Tubes |
|---|---|---|---|---|---|---|
| 29x4.40 | 21" | $2.20 | $1.10 | 30x3½ | $2.20 | $1.00 |
| 29x4.50 | 20" | 2.40 | 1.20 | 31x4 | 2.95 | 1.15 |
| 30x4.50 | 21" | 2.45 | 1.20 | 32x4 | 2.98 | 1.17 |
| 28x4.75 | 19" | 2.75 | 1.25 | 33x4 | 3.00 | 1.18 |
| 30x4.95 | 21" | 2.90 | 1.30 | 34x4 | 3.05 | 1.19 |
| 29x5.25 | 19" | 2.95 | 1.35 | 32x4½ | 3.20 | 1.40 |
| 30x5.25 | 20" | 2.95 | 1.35 | 33x4½ | 3.25 | 1.45 |
| 31x5.25 | 21" | 3.20 | 1.50 | 34x4½ | 3.45 | 1.60 |
| 30x5.77 | 20" | 3.20 | 1.40 | 33x5 | 3.45 | 1.70 |
| 32x6.00 | 20" | 3.20 | 1.40 | 33x5 | 3.40 | 1.70 |
| 32x6.00 | 21" | 3.20 | 1.40 | 34x5 | 3.50 | 1.75 |

**12 MONTHS SERVICE GUARANTEED**

**Other Sizes**

Only $1.00 deposit with each tire ordered balance C.O.D. (If cash send money in full.)

**Reduce 5%.** You are guaranteed a year's service or replacement at half price. **MIDLAND TIRE AND RUBBER COMPANY**

Dept. 423, **1000 West Sixty-third St., Chicago, Ill.**

# Rotary Stencil Duplicator $39

**Print Bulletins, Circulars, Programs, Letters, with the Amazing "EXCELLOGRAPH"**

Simple and easy. **Just write, typewrite, draw or trace on dry stencil;** place in position and print up to 1,000 copies per hour. **All supplies and instructions furnished.** Guaranteed 10 years. Prints any size from postcards to sheets 9x14. Does beautiful work.

**SAVE MONEY—MAKE MONEY**

Savos and makes money for Merchants, Ministers, Teachers, Offices etc. Use it to build your business. Do work for others at big profits.

**Write for Free Book—TODAY**

Shipped at our risk. Positive Money-Back Guarantee. Amazing value. Thousands in use. Get free book describing all details and easy payment plan.

*Easy Terms*

**PITTSBURGH TYPEWRITER & SUPPLY COMPANY**

**Dept. K2 339 Fifth Ave. Pittsburgh, Pa.**

# QUIT TOBACCO

No man or woman can escape the harmful effects of tobacco. Don't try to banish unaided the hold tobacco has upon you. Join the thousands of inveterate tobacco users that have found it easy to quit with the aid of the Keeley Treatment.

# KEELEY

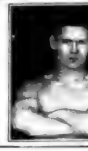
**Treatment For *Tobacco Habit***

**Successful For Over 50 Years**

Quickly banishes all craving for tobacco. Write today for Free Book telling how quickly Free yourself from the tobacco habit and our Money Back Guarantee.

**THE KEELEY INSTITUTE**

**Dept. D-120 Dwight, Illinois**



**I POSITIVELY GUARANTEE**

to increase your arms one-half inch in size, chest one full inch, strength 25%, health 100% in one week's time, by following my instructions and using my exerciser 10 minutes mornings and at night. Send $1 for complete course and exercisers. Satisfaction guaranteed or $1 refunded.

**PROF. J. A. DRYER**

**Box 1850-R Chicago, Ill.**

Safe: Yes, so safe that you may fly hands off one foot off the ground. So stable in all directions that it literally flies itself, and may even be landed hands off. So simple to fly that even the rankest student who has been successfully tolerated may safely build up their coveted flying hours.

So practical is the new HEATH PARASOL that it may be flown from any abandoned prairie or meadow. An airport is not necessary for the new Parasol, for it is so designed that high weeds are not a menace to landing or taking off.

Build a HEATH PARASOL from our plans with complete bill of materials even to fabric and dope at $199. Modern steel tube construction.

**Performance** Leaves the ground in 4½ seconds; climbs 200 feet in traveling 300 feet; travels 45 miles on a gallon of gasoline; carries greater useful load than its own weight; climbs to 16,000 feet; stored wherever you can store your car; glides 2 miles for every 1000 feet of altitude; stops within 30 feet on landing; quickly converted to glider or sea plane; parts may be purchased on cash or partial payment plan.

Buy, build, but fly a HEATH PARASOL, the fastest and most practical airplane for the power in the world. $975.00 ready to fly, Chicago. $199.00 for complete bill of material. Ten cents in coin or stamps brings large illustrated booklet.

# HEATH PARASOL

HEATH AIRCRAFT CORPORATION.
1727-29 Sedgwick St., Dept. M-7, Chicago, Ill.
Gentlemen: Inclosed find 10c for which send me large illustrated descriptive booklet on your Heath Parasol.

Name

Address

HEATH AIRCRAFT CORPORATION
1727-29 Sedgwick St. Dept. M-7 Chicago, Ill.

# Crashing PLANES for

This composite photograph shows why Dick Grace has to crash his planes at a certain spot, indicated by a blue circle on this month's cover, in order to avoid injuring cameramen and spectators.

# the MOVIES

by DICK GRACE
*the world's most famous movie stunt man*

Dick Grace and his rescue squad in front of crack-up No. 33. Grace is the seated figure. Members of the rescue squad are equipped with fire extinguishers, pliers, wire cutters, pulmotors, and similar tools.

## FOREWORD

**Dick Grace is by long odds the world's most famous movie plane crasher. He has cracked-up 34 planes intentionally, and lived to spend the money. The reasons why he has been able to climb alive out of these wrecks he tells in this thrill-packed article. Crashing planes for movie shots, such as Grace did in "Wings," "Lilac Time," "The Flying Circus," and many other films, is done scientifically, by physics and mathematics. How he does it Grace explains in this personal story written expressly for Modern Mechanics' readers, and his thrilling narrative is told with the same gusto and cool assurance that makes him the most famous stunt flyer in the world. Dick Grace is also author of the book "Squadron of Death," an amazing autobiography telling his own story and that of countless other stunt men.**

Dick Grace, hero of 34 airplane crack-ups.

"ANYONE who would crash an airplane intentionally is crazy," a gentleman with a florid complexion and a bulky fuselage said to another curiosity seeker by his side.

For some minutes they had been berating the foolhardiness of the pilot who was to intentionally dive an airplane into the mud flats of Sherwood Lake for the picture "Young Eagles."

The scoffing I received at the hands of these wise men did not bother me. By this time I was used to it. And they were halfway right. If it were they who attempted to do such a thing undoubtedly they would

# *Dick Grace Is Only "Crash Engineer" Who Has Survived 34 Crack-Ups*

**Not all Grace's plane crashes are on the ground. Here's one in which the movie script demanded that he fly into the side of a building. The crash engineer impaled the ship in the wall and emerged unscathed.**

be killed. I've been called a fool. I know many people believe me insane. The companies I work for give me no credit; to them I am but a service to be used at times when a thrill is urgently needed.

Why is it no one realizes why I *consistently* crawl from wreckage—from a mass of struts and torn wings which seconds before had been an airplane? Is it not possible that there is more to it than mere chance?

If I had crashed an airplane but once it could be said that it was all luck. Then I might be called a brainless fool and a daredevil. But I've crashed 34. If you see a squadron with that many ships on the line and say to yourself as you survey each one: "Now I'll crash this one!" or "Here goes that one," you would realize that 34 airplanes is quite a squadron.

I don't mean to say that there is no danger in crashing at a speed of from 80 to 110 miles per hour. I have had my neck, ribs, chest bone, some teeth, collar bones and a few other things broken in the last 14 years, but I challenge anyone to walk out of all of the crashes which I have done if they are performed under the same conditions and the same handicaps with which I have been confronted.

This may sound a little egotistical. To dispel any such idea I am going to expose a few of the minor details which have figured in the success of my crashes.

I have no voice in picking the location, nor can I dictate the nature of the ground into which I must fall. Sometimes it is in barbed wire entanglements of shell-pitted No-man's Land, and at others over cliffs, or into the roof of a house, or the edge of a muddy swamp. Whatever the nature of the location, I must accept it as part of the problem I must solve. Before the stunt I must know every inch of that territory and the ground surrounding it for several hundred yards.

The next thing I note is the prevailing wind, presupposing that in all likelihood conditions on the appointed day will be normal.

One of the little details which plays a most important part in the successful completion of a thrill is the time of day at which it is done. I have always tried to crash at 11:45 a. m. Such a statement sounds absurd—ridiculous. It would almost seem as if I were superstitious. But when consideration is given to this angle it becomes quite the sensible thing to do. At that time of day the sun is highest in the skies and so there is less likelihood of being blinded as I dip a wing or tear off a landing gear.

Equally important as the sun are the general wind conditions. I have found that the best prevailing weather for my purpose occurs at high noon. There may be a slightly stronger breeze at that time than earlier in the morning or later in the afternoon, but it is usually constant and steady, varying but slightly in direction or force.

It was eleven o'clock. In three quarters of an hour I was due for another crash, so

I went immediately for my physical check-up. I have made it a rule to have such an examination both before and after every crash.

The majority of people understand my object for the latter, but very few realize the importance of the former. A person's physical condition may change enough in 24 hours to make him unfit to stunt a ship, much less crash one. For the few seconds before and during the impact every muscle and nerve must coordinate. Complete relaxation as far as feasible must prevail at such a time. If the nerves are taut, the muscles will be also. My eyes, ears, lungs and blood pressure are tested. My pulse is taken.

The minute I crawl from the cockpit of the wreck there is a similar examination. So far there has not been a difference of one heart beat. This comparison of examinations is partially a scientific experiment. It gives me a basis to analyze the reactions of crashes on my entire system. If there were a great variance it would show that I was under a strain. It would show that I had a tendency to become excited.

Again I went to the spot where the crash was to take place. The border line behind the ropes was crowded—crowded with people who, if I should be injured, might rush in and ruin the shot. To avoid such a contingency a number of my crew, who had power to stop anyone from stepping into the restricted area, were placed at intervals along the ropes.

Eight men were detailed for fire duty. They were to act at the command of their leader and his instructions were to proceed immediately if the wreck should start to burn. As equipment they had two 40-gallon chemical tanks and a quantity of smaller extinguishers.

The doctor and nurse stood by a fast ambulance. The motor was idling, the driver in the seat.

Now that these three important divisions were properly cared for there remained but one to receive instructions—the actual rescue squad.

In charge of this group of men was Captain Watton, a soldier and a flyer. He had

**Some of the precautions taken by Dick Grace preparatory to cracking up a plane are shown in the above drawings. In the top picture the cockpit is shown with instruments padded, wooden longerons braced with steel, and pilot strapped in place with special belts. Center drawing shows how main gas tank is drained and slit to prevent sudden compression and explosion of gases. Fuel is supplied by small wing tank. Anvil shown in lower drawing prevents plane flopping over.**

**Dick Grace standing before a Spad cracked up for "Wings." A cedar post supporting the barbed wire visible between the wings penetrated the fuselage within a few inches of Grace's head.**

been with me on "Wings," "Lilac Time" and a score of others.

"All set, Tom?" I asked.

"Every man has his implement of rescue as usual. One has four-foot nippers, another short steel cutters, others have hammers, saws, pliers, sledges—and as long as there is danger of landing upside down in the mud I have a pulmotor."

I knew the captain; efficient as always. Perhaps a habit acquired from his years with the Service—maybe because he, Lieutenant Commander Harry Reynolds and I had been together so often before.

I took my last walk alone before going to the emergency field for the take-off. I stood on the spot where the ship would finally lay, and from there walked over the ground into which the ship would plunge.

Sometimes a crashing airplane will spread debris over a space of a couple of hundred feet. At others all the force must be dissipated in four or five yards, which means that the plane strikes with great impact. The speed of 85 to 110 miles an hour must be lost instantly. If the distance is 20 feet and the momentum 100 miles an hour I must stop five miles of speed in every foot of space. The force of such a shock is terrific both on the rending, tearing parts of the plane and upon the body.

The crash for which I was prepared was exceptionally difficult. I was forced to do the complete crash in approximately ten feet. The location picked for it lay in a bowl. Mountains from 500 to 700 feet completely surrounded it. Once I dropped into the uneven air currents below I had no alternative. It must be a crash, whether it was recorded by the sound cameras or not. I did not dare to miss, for directly in front of the spot, lined up on parallels, was the

**Wreckage of an automatic movie camera struck by a movie bombing plane whose pilot leaped out in a parachute, as called for in the story. It gives a good idea of what would happen to camera and cameramen if Dick Grace should miss the spot aimed at. No wonder he's careful.**

huge battery of cameras. An error of judgment would kill half a dozen people and injure a score more.

Getting into a waiting automobile I was taken to the ship. I felt sorry for it, all dressed up for the last flight in a newborn suit of camouflage. Rather like buying a

new suit in which to bury a person. The linen was all smooth and the wings were taut. It stood there awaiting the end aloofly. But soon the linen would be crumpled, the propeller splintered, the motor pushed through its stomach and the ribs piercing its guts. It would join

Seems hard to believe that the pilot of this plane could have emerged intact—but Dick Grace did. He cracked it up in the film "Young Eagles."

Colleen Moore, star of "Lilac Time," inspects one of Dick Grace's crack-ups. As usual, he stepped out of the wreck safely.

that ever-growing squadron of dead ships which I had sent flying out of existence so that people might gasp or cry or laugh.

Don't tell me that ships don't have personality. Some I like and some I hate. I hate to destroy anything I like; and like to destroy anything I hate—it's human. And ships, of course, aren't supposed to like or dislike, but they do perform better for some pilots than others. I think they respond, like horses, to those who really know how to handle them.

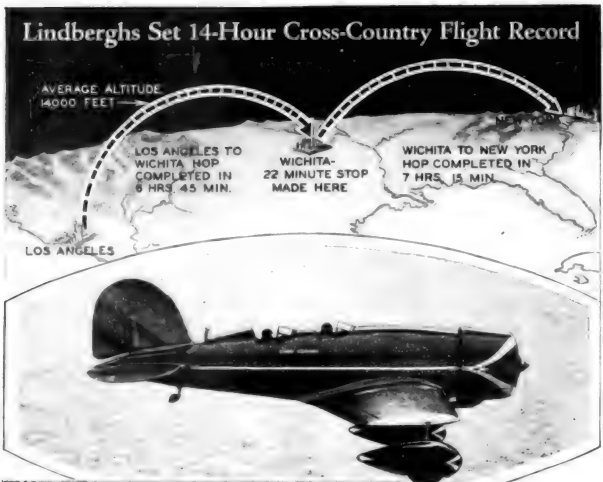
Eleven-thirty. In 15 minutes the crash was due, so I proceeded with the last of the funeral arrangements. The gas had to be drained from the main tank. Once I had a fire which burned almost 800 square inches of skin from me. No death is more horrible, more painful. To avoid this menace I built a tank on the top wing designed to carry just twenty minutes more gas than I actually needed for the flight. There are many advantages to such a system. If I used a partially full main tank the explosion would be enough to give me wings all of my own. One that is full will burn but seldom explode, there being no room for expansion of gases. It also gets away from pressure feed, though few ships of the present day are so equipped.

After draining the big tank I slit the bottom of it so there could be no sudden compression of air. I carefully measured the amount of petrol for the flight and having warmed the motor before, was set to go on as soon as the prop was turned over.

With this last precaution behind me I got into the seat. The switch and throttle had been moved so close together that I could operate them with three fingers. The tachometer was imbedded in horsehair at the left of my feet and the rest of the instruments were hidden behind a thick padding which covered the entire panel.

Other than these precautions the cockpit was similar to that of any ship, though in some with wooden or old steel longerons, bracing is often necessary.

*(Continued on page 184)*

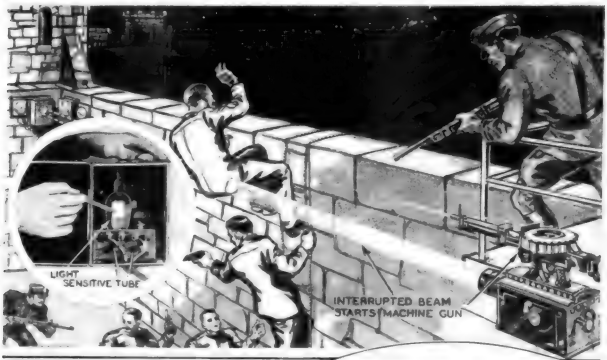



The stream-lined Lockheed Sirius plane in which the Lindberghs set the new cross-continent record. Map above shows graphically how flight was made.

Col. and Mrs. Lindbergh on their arrival at Roosevelt Field, N. Y.

PROVING the possibilities of high altitude lanes in speeding up air travel, Colonel and Mrs. Charles A. Lindbergh recently blazed a new record by crossing the continent in 14 hours and 22 minutes. The plane used was the low-winged Lockheed *Sirius*, especially built for Col. Lindbergh. Altitudes maintained varied between 10,000 and 15,000 feet, and it is Col. Lindbergh's belief that commercial air traffic will soon travel the high altitude route because of savings in time. The previous record for a trans-continental crossing was held by Captain Frank M. Hawks, who tells in this issue of MODERN MECHANICS of his latest feat in being towed across the country in a glider. The Hawks record was 17 hours, 26 minutes, which the Lindberghs bettered by three hours. Col. Lindbergh himself disclaimed a record, since he stopped at Wichita to take on fuel, while the flight of Capt. Hawks was non-stop, but the new record is generally accepted.

# Light Beam Stands Guard on Prison to Quell Jailbreak




**The "Electric Eye" jailbreak detector in action. The prisoner, crossing the path of beam, cuts off light, causing the light sensitive tube in the beam receiver, shown in the insert, to start the machine gun firing. This action is entirely automatic.**

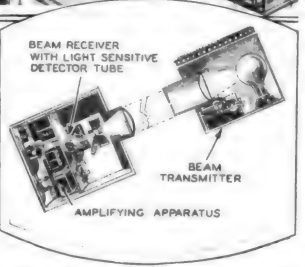



**Diagram of beam transmitter and receiver, and light sensitive tube which records breaks in light.**

A LIGHT beam as a prison deadline—a beam that when interrupted by a felon bent upon making his get-away operates a machine gun pointed directly at the victim—is the latest addition to prison jailbreak safeguards. The apparatus, consisting of a beam transmitter which shoots a small invisible ray along the prison wall, and a beam receiver which picks up and records any breaks in the light, and at the same time fires a machine gun, is being installed in many prisons housing intractable criminals. And owing to its deadliness, its reliability, its silence and invisibility, the contrivance is doing much to cut down the prevalence of prison breaks.

The beam transmitter is an instrument similar in most ways to a motion picture machine, and has mounted on it a machine gun of the Lewis type. The transmitter projects a small beam alongside the wall close to the top which is picked up at the other end of the wall by the beam receiver, otherwise known as the "Electric eye." The heart of the receiver is the light sensitive tube, shown in the insert in the photo at the top of the page, which registers the projected beam. At any interruption of the beam impulses are set up in the tube which are amplified to an intensity that they actuate the firing mechanism of a machine gun mounted atop the transmitter.

The machine gun is trained along the path of the beam, and when a prisoner, attempting to climb the wall to escape, crosses the path of the beam, the electric eye operates instantaneously, firing the machine gun and thus cutting down the would-be jailbreaker.

# Numbered Squares on Board and Code Teach Dance Steps

Walter Carlos, Berlin dancing master, demonstrating use of his step "Code" and checker-board instructor.

LEARNING complicated or simple dance steps need not be the awkward and difficult procedure that it usually is if the new checker-board dance instructor pictured at the left is utilized by students of the dance. The board, an invention of Walter Carlos, a Berlin dancing master, is divided into squares and each square numbered with bold figures. For each step there is a "dance code" to be followed, or a series of numbers representing the squares that the student is to place his foot on in consecutive order. The learner merely takes home his board and spreads it out on the floor, and with the aid of a phonograph or radio to give rhythm, follows the code till the step is mastered.

## Shellac Holds Pipe Threads Tight

MOST everyone has run up against the problem of making worn pipe threads hold tight. The easiest way to do this, outside of buying new parts, is to put a few spoonfuls of shellac in a can and light it with a match. After the alcohol has burned out and the shellac become very thick quickly smear the threads with the substance and screw tight. It can also be used to good advantage on loose wood screws. This cement must be used at once as it hardens rapidly.

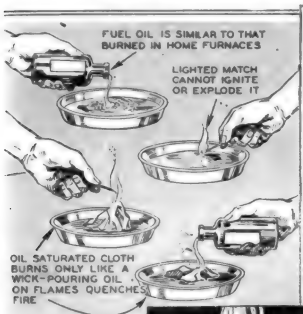
## Tonoscope Registers Waves of Voice and Shows How to Correct Tones

SINGING in the bathtub may become a lost art if the machine shown here is installed in every home. This contraption, which is known as the Iowa Tonoscope, will enable one to know the worst about one's voice immediately. Even though no delegation of indignant neighbors calls to register protests, even though your best friends won't tell you, by listening in on this machine you will know at once whether or not you can sing.

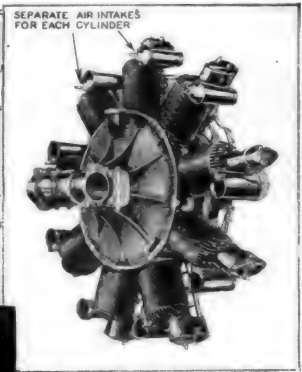
The device was invented by the students and professors of the University of Iowa and it registers the waves of the voice and shows how to correct them. The tone waves are graphically recorded on the revolving drum.

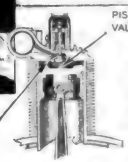
A student is shown above listening to the correct tones while comparing these sound waves with those of her own voice.

# New Diesel Air Motor Cuts Fire Hazards, Weight, Cost




Non-inflammability of the fuel used in the new Diesel motor is demonstrated in the illustrations above. As shown at the right, the oil burns only in a highly atomized condition, thus reducing fire hazards.




External appearance of Packard Diesel Aircraft motor.

A DIESEL aircraft motor that is decidedly radical in every phase of its operation has recently been designed and built by Capt. L. M. Woolson of the Packard Motors Co. Severe tests proved that the motor, built on principles differing vastly from those of gasoline motors, will revolutionize the construction and characteristics of airplane motors, permitting in its use of ordinary furnace oil for fuel, far greater cruising radius, and reducing to a minimum both fire hazards and cost of operation.

The new Packard Diesel engine, front view of which is shown in photo above, is of the radial air-cooled type, having nine cylinders with a bore of 4.812 inches and a stroke of six inches. The engine is rated at 225 horsepower, at 1900 r.p.m. and weighs 510 lbs. The outside diameter of the engine is slightly over 45 inches.

The chief point of departure between the two motor systems is in the ignition system, the new Diesel engine eliminating the conventional ignition system. Where in a former type an electric spark is depended upon to ignite the combustible mixture in the cylinder, the latter achieves the same operation by the compression of the cylinder air to an extremely high temperature of about 1000 degrees Fahrenheit. The fuel oil is injected into the cylinder in a highly atomized condition at the point just before the end of the stroke is reached. The super heated air then effects ignition of the oil vapor, and the explosion forces the cylinder downward.

The use of such a system of ignition entails many other advantages. Accurate adjustment of the fuel-air mixture is rendered unnecessary. As the Diesel engine requires a lesser grade of oil both space and cost are thus cut down, and as the fuel oil used is inflammable only in a vapor form, the danger of fire hazard is immensely lessened. Where the gasoline engine weighs around 20 lbs. per horsepower, the new Packard Diesel weighs only one-tenth as much.

# The MECHANICS of

The Babe shows how he utilizes the force of his swing to start him on his way to first.

**The Sultan of Swat! The Bustin' Babe! The most colorful player the game has ever seen! In these terms we habitually think of Babe Ruth. In this article he reveals many of the secrets that have made him the game's most valuable player.**

IT SEEMS strange to talk or write of baseball mechanics. Yet the term is a good one, for we who play baseball are as much mechanicians as the engineers who develop airplanes, the men who operate engines or the mechanic who tinkers with an automobile in a garage. The only difference is in the engine. Instead of carburetors and differentials we deal with legs and arms, instead of cylinders we have lungs, and instead of gasoline we burn nervous energy.

There are two sides to baseball. One is the mental side which includes alertness, baseball knowledge, quick thinking and keen perception. The other side is mechanical—and that includes the business of throwing and hitting; the mechanical act of running bases, of making balls curve or making hits go in the direction you want. It is as much a superiority in baseball mechanics as it is a superiority in baseball mentality that distinguishes the big leaguer from the sand lotter.

Take the matter of pitching for instance. The average sand lot pitcher works entirely with his arm. His chief idea is to get the ball over and keep the hitter from hitting. And that's just the kindergarten of pitching. The big league pitcher pitches with his head. He is not half so much interested in striking out the batter as he is in making that batter hit where he wants him to hit. The big league pitcher tries to complete his game with as few pitches as possible and naturally the best way of doing that is to make the batsman hit.

A pitcher like Herbie Pennock or Waite Hoyt for instance can, nine times out of ten, make a hitter hit the ball in the general direction he wants it to be hit. And there are general rules governing. For instance suppose there is a runner on first base, none

# BASEBALL

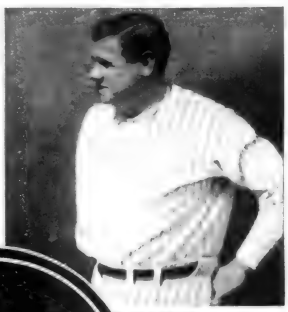
by BABE RUTH

out, and the score is tied. The natural play for the hitter then is a sacrifice which will get the runner to second and put him in scoring position. The pitcher's job is to stop that sacrifice and the green sand lotter nine times out of ten will either pitch a waste ball or try to fool the hitter with a curve. But not the big leaguer. No indeed. He pitches a fast ball high and inside knowing that such a pitch is the hardest ball in the world to bunt.

There are other rules, too.

With a right handed hitter the ordinary rule is to pitch outside if you want him to hit to the right or inside if you want him to hit to left. With a left hand hitter the process is reversed. Of course, there are exceptions. But no rule is perfect, and where there is an exception the pitcher must study the hitter.

Fans frequently asked me how a pitcher knows what to pitch to a given hitter. Until you've pitched to a hitter once or twice and know his style that's a hard thing to answer. There are some general rules however even for that. If the hitter holds his bat rested on his shoulder, standing loosely at the plate, a fast ball inside is apt to be the best pitch. If he stands far back from the plate and is inclined to step away on his swing, then a curve ball on the outside is apt to be the medicine.



Awaiting his turn at bat, Ruth stands relaxed both mentally and physically.

Dazzy Vance shows how he grips the ball to deliver his high-priced curve.

Heinie Groh and his unusual stance. How would you pitch to such a batter? A good pitcher knows the weakness of a batter and pitches accordingly.

Here's another tip to young pitchers. Every pitcher who ever pitched a ball game has his favorite pitch. Perhaps it's a fast ball. Perhaps it's an overhand curve, perhaps it's a side arm curve. (The one we used to call an out-shoot when we were kids.) The young inexperienced pitcher pitches that pet of his every other pitch

**Heinie Groh shows you how to bunt. He's ready to meet any kind of pitch.**

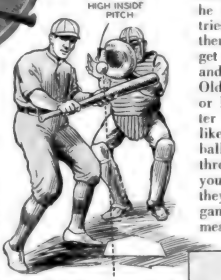
until opposing hitters lay for it. The real pitcher uses his "pet" only when he's in a hole—saving it up until he really needs it. Then it's worth something.

Take Herbie Pennock for instance. Pennock's best pitch is an overhand curve that breaks down and out. He may go for three or four innings without showing it once. But when he gets in a hole—when he has to make sure of the hitter and wants him to hit the best he has—then he comes in there with that overhand curve.

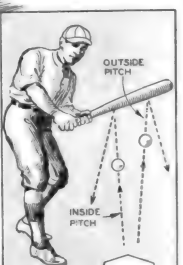
A lot of people seem to think that because a pitcher is in the big leagues and winning ball games he must have something wonderful in the way of "stuff." That's not always true. I've seen sandlot pitchers who were just as fast and had just as much break on their curve ball as any big leaguer. But they don't know how to pitch. Nine-tenths of pitching success is control and the ability to "mix 'em up." No pitcher can get by on one thing alone, whether it be a fast one or a curve or a slow one. But a pitcher who has good control and knows how to pitch can get by with very little stuff on the ball.

In this connection I always think of the late Urban Shocker who was with St. Louis and the Yankees for so many years. As a young fellow Shocker had a lot of stuff but during his later years he got by on his head alone. His curve ball, as he used to say himself, "was just a wrinkle," and his fast one wouldn't stump much if you caught it with your bare hands. But he was a great pitcher just the same—because he had perfect control and could put that ball right where he wanted it.

Control, you know, consists in something more than merely getting the ball over the plate. Good control means the ability to hit a catcher's glove, wherever he holds it, in fourteen tries out of fifteen. And there's only one way to get it. That's to practice and practice some more. Old timers like Pennock or Bob Shawkey or Walter Johnson or fellows like that never pitch a ball that they're not throwing to a target. If you watch them when they warm up before a game you'll see what I mean. Young pitchers just get out there and throw but the wise old heads always are shooting at a mark perfecting their control.




**Showing why a high inside pitch is hard to bunt. Reaching for a ball near the shoulder is extremely awkward.**



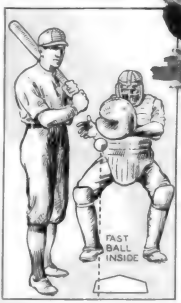

**Showing why a left-handed batter will usually hit an inside pitch to right and an outside pitch to the left.**

Shocker used to have a system in pitching that was a new one to me. Every time he faced a new hitter whose weakness he didn't know he'd follow it. His first pitch would be aimed at the catcher's right shoulder. His next one would go to the catcher's left knee, then at the left shoulder, then at the right knee. In other words he would keep that ball

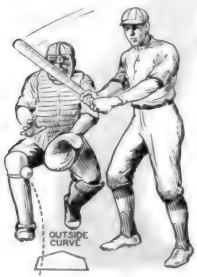
always around the corners, never giving the hitter a good ball to hit at. You know the toughest pitch in the world for a hitter is a ball that's so far outside, or inside, so low or so high that you can't quite get hold of it and yet one that you know will be called a strike if you let it go by.

Anybody can throw a curve ball. If you grip the ball firmly and let it roll out over the side of your fingers when you deliver it, the thing is bound to curve. Natural twist and gravity will take care of that. But the real curve, the sort that gets by in the big leagues, must be sharp breaking and quick —and that sort of curve is obtained only by a quick snap of the wrist at the time the ball is delivered. The quick snap of the wrist gives the ball the added twist that makes it break quickly. And every pitcher knows that it's not the width of the curve that fools the hitter so much as it is the quickness of the break. The old round house curve that breaks eighteen or twenty inches is a lot easier to hit than the fast breaking curve that breaks only two or three inches.

The pitcher aims at the catcher's shoulder or knee, not at the glove.




If the batter stands close to the plate with the bat on his shoulder he won't have time to step back in time to hit this pitch.




An outside curve will be out of reach of a batter who stands far back of the plate.

Yet a curve ball alone, no matter how good, doesn't make a pitcher. The best curve ball I ever looked at was possessed by Walter Beall, and he couldn't even make the big league grade. He had all the stuff you'd want to see. His fast ball zipped down there with a great hop and his curve ball was almost unhittable. But he couldn't get control —and as I said before, control is the biggest single item in pitching success.

Maybe you'd be interested in a word about the mechanics of hitting. The poor hitter can improve his hitting if he'll work at it. The first secret of successful hitting is complete relaxation. That sounds funny but it's true. You've got to stand up there at the plate naturally with your muscles relaxed and ready to move in any direction. Despite the fact that I get paid for hitting home runs, I think it's a mistake for the kid player to attempt distance hitting. The minute you try to drive that ball for long distances you press, and in baseball as in golf, pressing is bad business.

Nor does it pay to take too long a swing. Ever since the home run became so advertised ball players have had a tendency to grab their bat at the end and take a swing from the heels at every pitch. That's bad. They're thrown off balance and as a result are suckers for any sort of change of pace. The ideal batting type, according to my way of

*(Continued on page 190)*

# Side Car Attached to Tricycle Adds Fun for the Children

Side car attachment for child's tricycle doubles vehicle's utility.

THE use of side cars and rumble seats is now being extended to children's vehicles, thus cutting down the expense of parents by making one vehicle serve two children. A recently patented children's tricycle with a side car attachment suitable for carrying an additional passenger is pictured in the photo at the left. Children of small weight can be carried without adding perceptibly to the burden of the driver or to the wear of the machine. The vehicle is durably constructed of wood and metal and has an attractive appearance. It will prove a great boon to children who have a smaller brother or sister to take care of.

## Diminutive "Super-Ear" for Deaf

A HIGHLY sensitive detector of sound known as the "Super-ear," a device which operates on a new and unique principle, has recently been put on the market for the relief of deafness. The "Super-ear," one method of the use of which is shown in the photo at the left, is adaptable for use in any position. It can even be concealed in the palm of the hand, and attracts little attention. It operates by compressing the received vibrations of sound into a series of successively smaller chambers, thus securing greater intensity.

Diminutive "super-ear" held in place by a handle.

## Child's Table Converts Into Desk

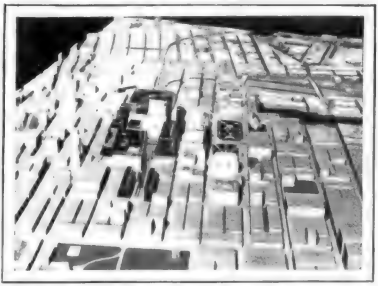
A SMALL children's table convertible into a children's play and study desk, like the one in the picture below, makes an excellent addition to any nursery. The top hinges up and is held in place by collapsible braces. Under the top are revealed counters, a small blackboard, and a rack for holding children's magazines. A small desk space permits writing, the remainder of the space being used for compartments to hold blocks, crayons, moulding clay, and other study material. A small chair of the proper height completes the arrangements.

Child's table convertible into a desk for study.

# Engineers Model Plans to Make Montreal Ideal City

MONTREAL, the commercial capital of Canada and a city afflicted with growing pains which retard her expansion and business, is to have her problems solved by an organization of enterprising engineers who are setting about to build a city within a city. In the photo of the model at the right some idea can be gained as to the nature and magnitude of the projects, which when realized will cost about $100,000,000 and make Montreal into one of the model cities of the world, capable of accommodating its expanding population.

A towering new railroad terminal capable of meeting the needs of a million people, with electrified subterranean lines to facilitate handling of traffic and to insure greatest economy, is the center of the project. There is to be an entirely new downtown business district, with streets lined by a battery of skyscrapers. Traffic congestion is to be relieved by the construction of vast garages with an abundance of parking space.



**Engineers working on the projects embodied in the model of Montreal above will remake the city into an ideal metropolis.**

## Crack U. S. Navy Pilot to Bring Gigantic Dornier DOX to America

WHEN the gigantic Dornier DOX, the heaviest craft of its kind in existence, begins its long flight east across the Atlantic to New York, it will be piloted by an American, Lieut. Clarence H. Schildauer, prize pilot of the United States Navy, who is shown in the photo below, with a $15,000 model of the ship whose controls he will handle. Taking off from Lake Constance, Germany, where it is harbored, it will carry about fifty passengers; and its flight will be unprecedented in the history of heavier-than-air craft.

The mammoth seaplane will be powered by twelve motors of American make, can carry as high as 175 passengers, and in time of war can be converted into a bomber. The passenger accommodations are located in the fuselage. Above is the pilot cabin and chart room, with the engine control room just to the rear. From this room access can be had to any of the twelve motors.

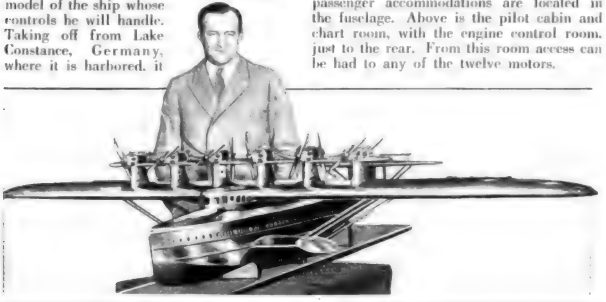


**Photo of Lieut. Clarence Schildauer, U.S.N., with model of the Dornier DOX, which he will pilot.**

# Battling a BILLION

An attempt to smuggle Florida grapefruit, infected with the Mediterranean fruit fly shown at right, failed when quarantine inspectors discovered the fruit hidden inside a package supposed to contain only celery.

THREATENING the very source of man's existence—his food supply—billions of hungry insects have declared war on mankind and have waged it with such success that it is no exaggeration to state that today insects are the most dangerous enemies of the human race.

The South has its boll weevil, Pennsylvania and New Jersey have their Japanese beetle, two Texas counties have the Mexican fruit maggot, more than 20 states in the union have Oriental fruit moth, California has pepper weevil, northern Middle Atlantic states have European corn borer, and nearly all the western states have alfalfa weevil—all because someone was careless and carried these plant and fruit pests from one state or county to another.

It was an oversight which let the citrus canker into the orange groves of Florida where, in 10 years, it resulted in the destruction of 3,500,000 orchard trees by fire, with no provision for compensation to the grower for loss of crops or trees. But the day of oversights is past. Today there are plant quarantine boards all over the country which see to it that no more destructive plant pests come into the United States.

Mechanical methods of control have been enlisted in the relentless fight on insect pests. In the case of the European corn borer which threatens the great bread basket of the nation, the corn belt of the Middle West, crude oil burners of special design have proved effective weapons. Oil tanks, with air compressors mounted near the driver's seat, force oil at a pressure of 200 pounds per square inch through long lines of rubber hose to the burners, which are light carts made of pipe through which the oil is forced. The rear end of the burner frame is 20 feet across and is studded with jets like the burners of a gas stove. Flames shoot downward, destroying corn stalks and insect hosts in the intense heat.

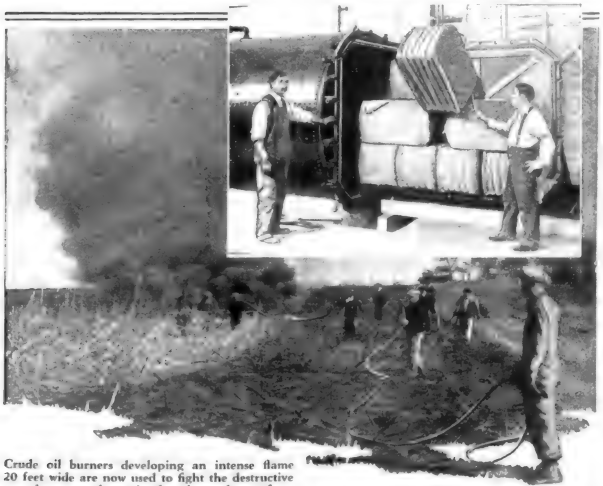
The cotton boll weevil could not be classed as a braggart if it were to wear a sign reading: "I cost the cotton growers of the South $300,000,000 a year." His right bower, the pink boll worm, is rapidly growing into a major menace. Citrus canker, prevalent in the Gulf Coast states, is a bacterial disease with no other known control than incineration. Twenty states annually spend millions of dollars in an effort to control the Oriental fruit moth, which has only 14 hosts. Is it then any wonder that quarantine authorities are bringing all the forces of science to bear on the effort to stamp out the Mediterranean fruit fly, which has 74 known hosts? This super-pest, the latest to seek admission to this country, could easily cost fruit growers $250,000,000 a year in control work and crop damage.

Uncle Sam stops all shipments of fruits from countries where the Mediterranean fruit fly is known to exist. It isn't enough to look for visible evidence of these pests, with a microscope. The flies sting the fruit, leaving eggs under the outer skin. These eggs hatch maggots which feed upon the fruit until the pulp breaks down. Then the maggots crawl into the ground, to emerge some weeks later in the form of fruit flies which return to the trees to deposit more eggs.

Travelers are more dangerous than gun-

# ENEMIES

**With flame throwers and fumigators, government agents wage incessant war on a host of insect enemies which threaten crops.**



**Crude oil burners developing an intense flame 20 feet wide are now used to fight the destructive corn borer, as shown in the photo above of an Illinois cornfield undergoing treatment which incinerates the insect pests. Insert shows bales of cotton being placed in a fumigator which kills the larvae of boll weevils which may be in the shipment.**

toters when they yield to the universal impulse to bring home plants and seeds from foreign countries. Cross-country motoring has greatly increased the need for vigilance on the part of the inspectors at the plant inspection stations which most states now maintain on their state lines to bar out pests from infested areas.

Not long ago, in a western state, quarantine inspectors intercepted a package containing celery, shipped from Florida. Inside the package was a tier of celery which concealed a dozen Florida grapefruit. Citrus canker is carried extensively on the skin of this fruit, and it is certain that if the shipment had entered an uninfected district a disastrous epidemic would have been started.

Alfalfa weevil has been found at quarantine stations in Idaho, Utah, and Montana, on blankets spread on the ground by motor tourists, as well as in shipments of baled hay. In certain districts of Arizona the navel orange does considerable damage by getting under the navel scars and breeding larvae which ruin the fruit. Several states maintain a strict quarantine against this fruit, yet there is always the danger that a motorist will have a contraband orange in his pocket when he crosses the state line, and will throw the peel carelessly by the roadside.

The heaviest barrier against foreign insect pests and disease is maintained along the Pacific coast, from British Columbia to Mexico. The Atlantic seaboard is adequately guarded against such invasion, both by federal and state authorities. The next strongest barrier is the eastern border of California.

# Across the Continent

This map shows route of the Hawks-Jernigin glider flight, which passed over sixty cities in twelve states.

**For the first time in history the United States has been crossed by a glider in tow behind an airplane. Capt. Frank Hawks, the man who accomplished this epochal feat, tells here his story of the great adventure in which he has written a new page in the history of air travel.**

WE TOOK off from San Diego, Duke Jernigin and I, on the first lap of the first transcontinental glider flight ever made. Duke Jernigin, who signs himself formally as J. D. Jernigin, Jr., sat at the controls of a Waco biplane to which my cabin glider *Eaglet* was tethered by a 500-foot tow rope. The wheel chocks were pulled from in front of Duke's plane—she started rolling across Lindbergh Field—and in a moment my glider was jerked into the air 500 feet behind his plane. We were off!

# *in a* GLIDER

*by* CAPT. FRANK M. HAWKS

*Who was towed from San Diego to New York in a cabin glider*

J.D. (Duke) Jernigin, Jr., was pilot of the Waco biplane which towed the Eaglet cabin glider of Capt. Hawks. Above Tucson, Ariz., the tow rope parted, when it was permitted to draw too taut, and a forced landing was made. The flight ended on schedule in New York City.

I was alone in the *Eaglet*, but I was by no means isolated. The tow rope which kept my craft floating along behind the biplane supported a telephone wire which enabled me to talk with Duke Jernigin—if we had to change our plans on account of weather or other unforeseen circumstances, we could talk the situation over together. Later on, I was mighty glad that we had that telephone.

Everything went along swimmingly until we neared Tucson, Arizona. Here occurred the most spectacular incident of the whole flight, and it occurred suddenly, without warning—the tow rope snapped! I was cruising along peacefully 500 feet behind the plane, thinking pleasantly of how splendidly everything was going, when I felt a sharp jolt and had just time enough to cry "Duke!" over the telephone when I went diving downward. A sudden gust of wind had snapped the tow cable.

It was at this point that I began to appreciate the staunch qualities of the *Eaglet*, the first cabin glider ever constructed. If necessary, I could have pushed aside the cockpit covering which protected me from the weather and made a parachute jump to safety, but the glider responded to the controls nicely and I made a safe emergency

## *Telephones Connect Glider Train Pilots*

**A telephone line supported by the tow cable enabled Capt. Hawks to talk with Pilot Jernigin in the towing plane. Note trigger for releasing tow rope connecting the plane and glider.**

landing. After a short delay in which the rope was replaced with a spare, we were off again, none the worse.

The reason for the tow rope's snapping, I think, was that I permitted it to get taut. In a sense, my glider was not actually towed, for I managed to keep the cable slack as much as possible to ease the strain on the wings of the glider. At the finish of each leg of the flight I released the *Eaglet* from the tow plane by a trigger arrangement and rode the air currents as long as possible before making a landing.

Probably you are wondering why the telephone connection between glider and plane was not irreparably damaged when the rope broke. You see, there were plugs at the ends of the telephone wire, and jacks in the tail of the plane and the nose of the *Eaglet*. These permitted the release of the wire by either craft along with the tow cable. Dry cells carried in the plane supplied current for the phones.

We kept nicely up with our schedule until we reached the city of our last lap, Buffalo, New York. We left Buffalo on what I thought was going to be the best day of our flight. Instead, it developed into the worst. We encountered high winds and after some deliberation landed at Syracuse after a flight of an hour and a quarter.

In taking off again for Albany there was a full 35-mile wind, and after we had climbed 3000 feet I could not manage to keep the *Eaglet* down. I went from 3000 feet to 6000 feet without control, like lightning, as if the *Eaglet* were a feather tossed up by a blast of air. In struggling to keep the glider down I had to dive at 80 miles an hour. Things were getting pretty perilous at this stage. There was little I could do. Suddenly the glider became wing-heavy on the right side. It was time to think fast, and for a minute I thought I would have to jump for safety via parachute.

But I decided to fight it out, even though the controls had been strained in the sharp battle with the up-currents of air, and we landed successfully at Albany after as thrilling a two-hour flight as I have ever experienced.

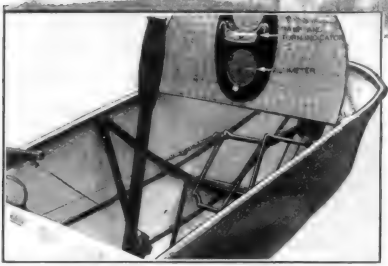
Down the Hudson river the going was not so difficult. Over the telephone—how valuable that phone had proved to us!—I learned from Jernigin that the continued rain and line squalls which had arisen were slowly but surely affecting his magnetos. Thereupon we struck out directly for Van Cortlandt Park in New York City, where we espied our landing place marked by a man in a white cap who waved his conspicuous top piece to signal us.

A quarter of an hour after I cut loose from the airplane I completed a series of spirals and turns and glided to a graceful landing. This ended 36 hours in the air, during which we averaged about 85 miles an hour. The flight was made in hops varying from 290 to 710 miles each day. We made six night stops.

The *Eaglet*, the novel glider in which the flight was made, is the only one of its kind ever built, and was designed especially for the Texas Company, which sponsored the flight, by Prof. R. E. Franklin of the University of Michigan, and his brother, Wallace. It is of monoplane type, specially stressed for towing, and has a 50-foot detachable wing made of plywood. Struts and fuselage are of steel. Weight, when loaded with pilot and cargo, is 500 pounds. Its gliding ratio is 22 to 1—that is, when one

## *Removable Cockpit Hood Is Novel Feature of Hawks' Cabin Glider*

**A 50-ft. wing spread enables the Eaglet to descend to a graceful landing. Insert above shows the removable cockpit cover of the Eaglet which protects the glider pilot from the weather. The cover can be forced off from inside if it becomes necessary for the pilot to jump in his parachute.**



**The cockpit of the Eaglet, the first cabin glider ever produced. The instrument board shown is the first used in a glider.**

mile high in still air it can glide to any place within a 22-mile radius.

Two novel features of the *Eaglet's* design are worth remarking. One is the cockpit hood, containing glass windows, which not only covers the cockpit and protects the pilot from the weather, but also adds to the streamlining of the ship. Another feature is the instrument board, containing an air speed indicator, altimeter, and bank indicator—the first instrument board ever to be installed on a glider.

I want to go on record as predicting that gliding will soon become a great national sport. I attribute this to the simplicity of gliding, as well as to the tremendous increase of interest in aviation. There's just as much thrill in gliding as in speeding through the air in a high-powered plane. And that the public is tremendously interested in gliding no one can doubt who observed, as I did, the enthusiasm displayed by crowds awaiting the appearance of the *Eaglet* over the 60 cities visited in the 2800-mile flight. In addition to the sport, gliding has a valuable role to play in aviation's development.

# Baby Is Always Comfortable in Portable Folding Crib

May be used as high chair or carried on automobile seat.

THE latest addition to baby's comfort and mother's convenience is a portable travel bed which is adaptable to many uses. The crib is made of strong flexible canvas supported on a rigid frame which is extremely light in weight.

The front and rear legs are adjustable to many positions with thumb screws, safety catches preventing the legs from slipping when the bed is resting on them. The bed may be adjusted for automobile seat use by folding the rear legs forward so that they rest on the auto seat. This arrangement leaves ample room for two additional passengers.

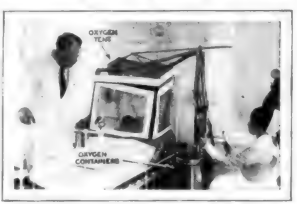
To change from a bed to a seat the front end of the crib is pulled out and dropped while the back end is pulled out, lifted, and dropped into a slot at any angle which may be desired. In this position it may be used at the table in place of a high chair.

The device is large enough to permit the free movements of infants up to the age of eighteen months and is provided with a steel rod and canvas strap which prevent the baby from falling out, no matter in what position the crib is placed.

## Science Perfects Oxygen Tent to Aid Babes' Fight Against Pneumonia

UNTIL recently, when pneumonia gripped the bodies of babies there was practically no hope for the little ones; but now the panting and gasping which comes with the disease vanishes as if by magic when the child is placed in one of these new oxygen tents which provides the life-giving air in just the right quantities for the little patient.

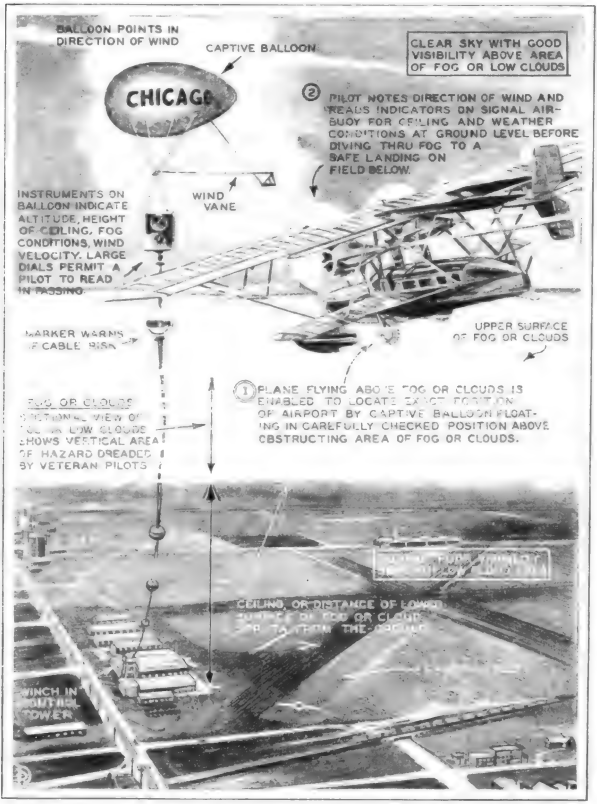
These new tents are really square frames having transparent sides through which the attending physician may watch the progress of the patient. They are placed over the crib in such a manner that they are practically air-tight, and the flow of oxygen is regulated by valves in the hands of a trained nurse under a doctor's supervision.




Nurse directs flow of oxygen as doctor watches.

Physicians who have tried the device report it as an effective curative agency.

# Air Buoy Marks Location of Field




**Suggested as a means of enabling fog-bound pilots to locate the position of landing fields, the floating air buoy above has won the approval of veteran airmen. A plane flying above the cloud or fog strata sights the captive balloon bearing the name of the airport, learns of conditions by reading large-dialed instruments suspended from the balloon, and is enabled to make a safe landing in spite of the fog.**

# The Story of the MATCH

Chemicals for the match tip are mixed in huge vats as shown.

**Modern methods and modern machinery have transformed the making of matches from a dangerous, disease-producing business into one of the world's great industries. Here we have the story of how science has made the present-day match possible.**

Friction method of producing fire with revolving stick.

*by* BEVERLY BARNES

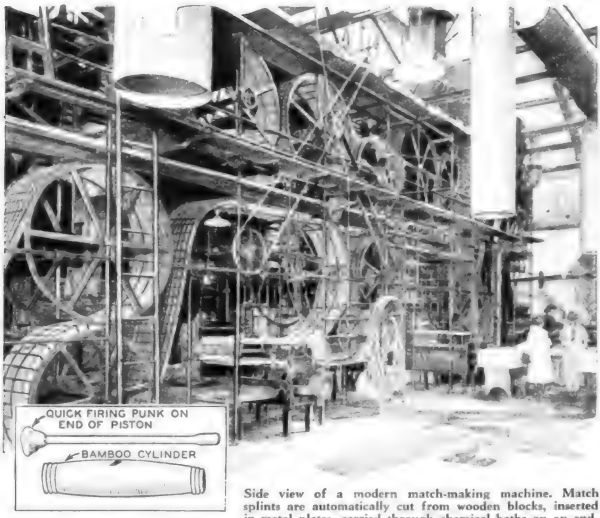
HOW many matches have you used today? You should, according to America's premier match making company, have struck seven, if you got the daily share allotted to every man, woman and child in the United States. In other words it takes 840,000,000 matches a day to supply the fire making needs of a nation of 120,000,000 people. That's at the rate of 306 billion, 600 million for normal years of 365 days.

If your seven came out of the paper books that are given away at cigar stores you were helping American match makers enjoy a monopoly, for a prohibitive tariff keeps foreign book matches out of this country. Or if your seven came from a big box of "parlor matches" they too were made in America.

But if you used a penny box of wooden stick matches you helped one of the world's greatest international trusts pay dividends, for the penny match box business of the world is practically all controlled from Stockholm.

There, in a beautiful office overlooking a courtyard in which fountains play among lovely statues, sits Ivar Kreuger, one-time youthful engineer in America, former soldier in the Boer war, and today the head of the Swedish match trust and one of the world's greatest mystery men. Through 225 subsidiaries scattered all over the world, except

# a Great World Industry




Malays produce fire by driving a piston into a tight-fitting cylinder. The heat of compression ignites it.

Side view of a modern match-making machine. Match splints are automatically cut from wooden blocks, inserted in metal plates, carried through chemical baths on an endless belt, and packed in cardboard boxes at the delivery end of the machine. Note wheels on which the belt travels.

in the United States, he makes seventy-five per cent of the world's matches, and out of the profits he buys match monopolies in many lands, and stabilizes national currencies by huge loans to governments. He goes and comes unannounced in the press, travels in private airplanes, maintains year around apartments in Paris, Berlin, London, New York and other cities, directs a world-wide organization that is rivaled in scope and size, among American companies, only by Standard Oil, and through it all remains one of the least known big business men in the world. In his middle forties, he is a bachelor, though his engagement to a Swedish countess has recently been reported.

And all this achievement has been built on an article that sells for a penny, a success story that makes the five and dime background of the Woolworth building seem tame in comparison. If a nation needs fifty or a hundred million dollars to tide it over an emergency Ivar Kreuger stands ready to lend the money—in exchange for a monopoly on that nation's match business. Even the state-owned match factories of France have been unable to compete, and have been turned over to the Swedish Trust, in exchange for a loan.

The Swedish penny matches, made of cheap northern aspen, can be laid down in this country, after paying the duty, for less than half what it would cost to make

**Matches must not break too easily, so insurance underwriters test their strength in the apparatus shown above. After burning, charred match heads must not drop off; this feature is tested by burning them in the clamp at right. Sketch above at right shows old flint and steel fire-maker for carrying in the pocket.**

similar matches over here out of fine white pine. Rather than compete in such an unprofitable market the Diamond Match company, America's biggest manufacturer in the field, acts as agent and distributor for the Swedish matches, and thus shares in the profits, confining its own manufacture of small size matches to a slightly larger and superior size.

The fact that the bulk of the world's fire-making business should center in Sweden is not an accident, for the Swedes have been active in match making almost from the beginning.

The first friction match was invented in 1827 by an Englishman, John Walker, who thought so little of his invention he decided it was too trivial to warrant patenting. He used sulphite of antimony, chlorate of potash, gum and starch for the match head, and to light one of his matches you had to draw it between the folds of a sheet of coarse sandpaper.

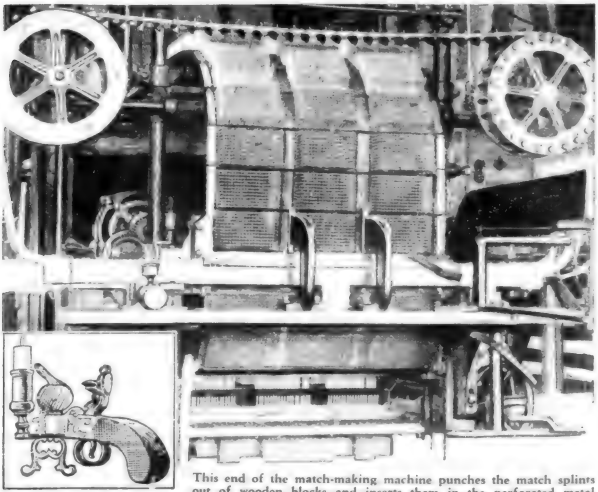
The next match was the phosphorus type, which continued with some modifications as late as 1911, when it was finally put out of existence by the development, by William Armstrong Fairburn, now president of the Diamond Match Company, of the modern match, which, unlike its predecessor, is not injurious to its makers nor a constant source fire risk.

Swedish ingenuity contributed the first development to match making in 1844 when C. E. Pasch excluded phosphorus from the match head and included it among the striking ingredients on the box—and that was the basis of the modern safety match, the kind that strikes only on the box. Two brothers, Johan Edward and Carl Franz Lundstrom, perfected the Pasch invention and started a small factory that same year at Jonkoping—and those two names, Lundstrom and Jonkoping, have been associated with match making ever since. The brothers made an ideal combination, one a business executive and the other an inventor, chemist and engineer.

They were followed by Alexander Langerman, also of Jonkoping, who invented the first match making machine in 1872, and that original machine, by the way, is still in service.

A modern match making machine looks very much like a huge newspaper printing press. Blocks of wood, cut as thick as a match is long, are fed in at one end, and out of the other comes matches packed in boxes. Dies stamp the match splints out of the blocks and stick the splints in holes in iron plates, which are attached to a moving, endless belt. One machine will produce 900,000 splints an hour. As the belt moves along the splints are dipped in a chemical bath that prevents afterglow when the match goes out, in paraffin to insure that they will burn freely, in the "bulb" compound, and finally in the chemical which produces the friction tip.

Before the day of the modern machine and the modern non-



Eighteenth century pistol fire lighter and tinder box with candle, fired by a trigger.

This end of the match-making machine punches the match splints out of wooden blocks and inserts them in the perforated metal plates on the endless belt which will carry them through the various chemical baths. One machine will produce 900,000 splints an hour. Best quality white pine is used which must be free from knots.

poisonous match, hundreds of workers died from a terrible disease in which phosphorus ate away the bones of the jaw. In those days splints were cut twice as long as a match, then rolled into a huge cart wheel by feeding them between two strips of belting which were being wound around an axle. When the roll reached a diameter of two feet or more it was removed, each side dipped by hand in the chemical baths, and then unrolled, after which the double-ended, double-length match was cut in half in the center and boxed by hand.

The romance of fire making dates back to the dawn of earliest recorded history. Six thousand years ago the Egyptians were using both flints and the fire bow, in which the vertical friction rod was rotated by a bow, with the bow string wound once around the rod.

The most interesting of all primitive fire making apparatus, however, is the piston and cylinder developed in the East Indies and India. No one knows how many centuries old it is, but it is the lineal forefather of the modern Diesel engine, employing the heat of compression to provide ignition. A bamboo cylinder a couple of inches long was fitted with a piston rod, wrapped with silk thread for a piston ring. A bit of dried fungus is placed in the end of the piston, which is then inserted a short distance in the cylinder. Holding the cylinder in one hand, the native strikes the outer end of the piston a tremendous blow with the palm of the other hand, forcing it down the tube so fast that the heat of compression fires the tinder. The piston is instantly withdrawn, the smoldering fire blown to a flame, and transferred to the hearth.

# A Bank Window Built in Street Wall for Motorists

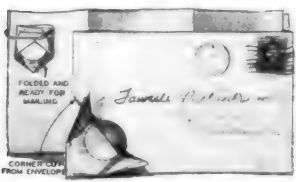
**This automobile deposit window, built in a bank wall in an alley, enables motorists to transact business without alighting.**

A DAYTIME auto-window depository designed to accommodate motorist patrons has been built in a one way alley wall by the City National Bank and Trust Co., of Dayton, Ohio. Two signs at the entrance of the alley indicate the location of the window. The bank customer has merely to drive up to the barred window and press the button when he wishes to make a deposit or cash a check. A clerk, on hearing the bell, steps up ready to serve him, and the automobilist can carry out his transaction without even alighting from his car.

The idea is becoming increasingly popular, both with firms and with individuals, especially the latter. The new window saves immeasurable time and nervous exasperation. It not only aids the motorists in expediting their banking affairs, but also relieves congestion in the city's streets during banking hours. Customers do not have to waste their time and effort in hunting for a parking place. And the possibility of losses likely to be incurred from holdups and purse-snatching is reduced considerably, as dangerous publicity, as well as contact with jostling crowds is avoided in the streets and in the bank.

## Coin Holder from Envelope Corner

IN THE absence of the regular cardboard piece for holding small coins, a safe and very simple coin holder can be improvised as shown in the picture below. A corner of an envelope is cut off, allowing two-inch edges, and the sides folded over, enclosing the coin. The holder is secured to the letter by a paper clip just above the coin.



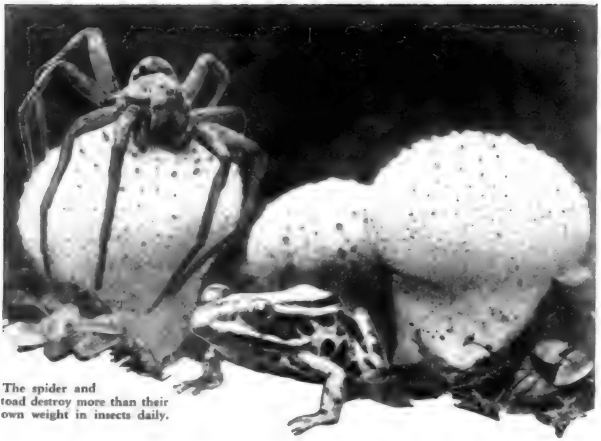

**A coin holder made from an envelope corner.**

## An Even Flow Regulator for Can

A WATER container with a very efficient flow regulator is shown in the photo at the right. About a half inch from the bottom a small hole is punched in the side of the can and a deep niche filed in the burring beneath. A piece of old inner tube is then snapped around the can covering the hole. The flow is regulated by raising or lowering the nail, which has been shoved down in line with the hole.

# Orange Ribbon Locates Airplanes Forced Down in Woods

A proposed method of locating planes which have been forced down in forests is pictured in the drawing above.



The spider and toad destroy more than their own weight in insects daily.

# The SPIDER — Master Engineer

SPIDERS are master workers, architects, engineers, craftsmen—creatures capable of learning from mistakes and acquiring new abilities, according to naturalists. And they are not insects. They are no nearer to insects than reptiles are to birds. Spiders have no wings, yet they make aerial journeys, borne by silken parachutes. They are master airmen. They speak to one another by vibrations. They have an unexcelled sense of touch and have structures that take the place of feelers and are exquisite organs of tactility.

Spiders have four pairs of legs which have curved toothed claws by which to hold on to anything that has any roughness of surface. They often run along the ceiling holding on with these claws—a really remarkable acrobatic feat.

In addition to its adaptable body structure the spider is a producer of a liquid silk which flows from a number of small glands. It comes out as a liquid jet, which hardens on exposure to air. Out of it the spider makes a vast number of complicated designs, structures, and contrivances. It is always paying out a drag line as it moves on difficult journeys. If in creeping along the ceiling its footing gives way, instantly the spider presses its spinning arms against the surface and so can sink with dignity to the ground, paying out a rope of silk. Sometimes it changes its mind when half-way down and turns again and climbs up the rope winding in the silk as it ascends. Every spider has this power of paying out a drag line. The drag line is the foundation of all the spider's engineering accomplishments.

In making an ordinary web the spider lays the foundation lines, often four in number; and these are made particularly strong, for they are used over and over again. Next the spider starts from the middle of the top foundation line and drops to the middle of the lower foundation line, paying out a line of silk, and pulls that taut. Then it climbs up that line, pauses for a moment in the middle, begins to pay out another line,

**The spider's web is the strongest fabric in the world for its weight.**

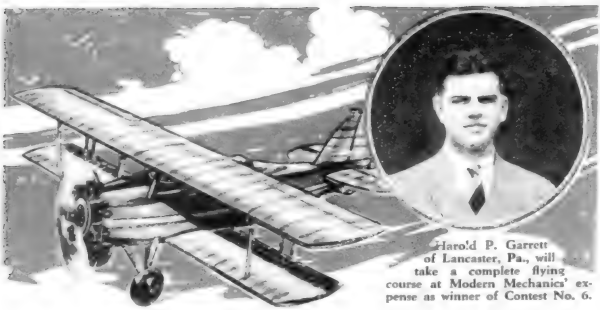
walks along the upper foundation line to the right-hand corner and pulls the third ray taut. Then back again to the center. down the lower half of the central ray, away to the left-hand corner, paying out the lower drag line and tightening it. So it goes from side to side till the rays of the web are like spokes of a wheel.

Now the spider goes to the center of the web and with peculiar strides swings from ray to ray, paying out what is called the primary spiral, which is not viscid, but is just the scaffolding. When it has completed the primary spiral, which binds all the rays together, it starts at the circumference and with a different kind of swinging movement it makes the second spiral, the sticky spiral, the spiral that forms the snare for the insects. Being economical, as it makes and completes the secondary spiral it eats up the primary spiral, the scaffolding that made the second spiral possible.

Naturalists have found a spider in New Guinea that spins a web six or seven feet in diameter, woven in a large mesh, varying from one inch at the outside to an eighth of an inch at the center. In the place where webs are thickest the black Papuan sticks upright in the ground the stem of a long and pliant bamboo, the top end of which has been bent over and tied so as to form a large loop. The loop makes a convenient frame in which to build a web, and soon the spider weaves in it.

The spider appears to have the dawning of a mind, a fact that has greatly interested scientists. It is peculiarly difficult for a man who is a creature of intelligence to get psychologically near a creature whose whole life is dominated by instinct. Spiders make their web, their trapdoor, their diving bell instinctively.

Yet the spider shows the beginnings of a better appreciation according to experimenting scientists. Professor Thomson tempted a spider with a fly that had been dipped in turpentine. It eagerly snatched at the food, but soon rejected it. In a half hour it had forgotten and snatched at the fly again. But after three or four times a turpentined fly would not tempt the spider.



Harold P. Garrett of Lancaster, Pa., will take a complete flying course at Modern Mechanics' expense as winner of Contest No. 6.

# Learn to FLY FREE!

**Get Into This Great Contest in Which a Free Flying Course Is the Grand Prize!**

HOLA! This is Andy, the Grease Monkey, broadcasting. The editors were so busy getting the magazine to press this time that they turned over the results of Flying Contest No. 6 to me. And I'm just the cookie to turn the trick.

Now you take the first prize winners in previous contests. They have come from all parts of the country. And this month there is a new state added to the list! Yessir! The first prize winner in MODERN MECHANICS' Flying Contest No. 6, ladies an' gents, is none other than Mr. Harold P. Garrett, who lives in Lancaster, Pennsylvania. That is a break for Pennsy, eh?

Mr. Garrett, whose picture appears on these pages through the medium of the half tone television system, is 21 years of age, is 5 ft. 11 inches tall, and weighs 195 pounds.

He will go to Roosevelt Flying School, Long Island. Here he will be in company with the winner of contest No. 5. Mr. Wallace Sweeney, who is also training at Roosevelt. It was from this wonderfully equipped, highly rated field that Lindbergh and others took off for their epoch making hops. Roosevelt trains on all types, mainly Fleets, and will give both these lads a thorough "course of sprouts." Down there on Long Island, and particularly at Roosevelt, flying is flying and birds stay on their roosts.

Second place, who won second place?

Say—look at the flyin' hombre in the second circle on this spread. Wally Harris, says me, is the man's name, and didn't he give Mr. Garrett of Pennsylvania a close run for the coveted ten hours behind that old joystick? Ask the jedges, by Joe! I know. And Wally Harris, runner-up in contest No. 6, gets a slick helmet, the highest grade thing carried by one of the oldest aeronautical houses in the country, as a reward for his effort, and a teaser to come again. Many who have entered contests and lost have come back again and won prizes, and look at Speed Ringle, the "Flying Swede" of Chicago. Speed entered every contest, and got better and better until he just naturally copped a prize. Of course, everyone cannot be first, but then, that's one of the things about contests which add zest to the thing!

Wallace D. Harris is a resident of Seattle, Wash., and is 23 years of age. He weighs 157 lbs.—an ideal weight for a pilot—and is 5 ft. 8 ins. and his paper was a corking good one. If Harris does as well with the l.c. or transport papers when he gets along in his flying career he will make one bon

Lewis Sterry, of Los Angeles, Calif., takes third prize—a pair of non-shatterable goggles.

Second prize goes to Wallace D. Harris, of Seattle, Washington, shown at left.

peelot!

I've saved the real dark horse for the last, ladies and gen'lmun! You never can tell what these Californy boys are up to. Or how high they are up. But I'm here to tell you—and this is neither confidential nor hooey—that one Mr. Lewis Sterry, of Los Angeles, Calif., cops a pair of non-shatterable goggles of popular type for being right up in there when it came to selectin' who should be the man to wangle the stick around.

So there's the line-up, you fellows—and I'm not forgetting the fair sex either, when I say that there are only a few more contests available. Send us good photos, and clear letters in response to the conditions stipulated in the entry blank printed here, and see how close to winning you can come!

## WIN YOUR WINGS!

### *Rules of the Contest*

For the best letter telling what you would like to see in a magazine of modern mechanics and inventions, as determined by the contest judges, MODERN MECHANICS will award a free flying course in some recognized flying school, paying all expenses of tuition, living costs, railroad fares and for some needed equipment in the form of helmet and goggles. Neatness, originality and adequacy of answers will be the guiding factors of the judges in determining the winner. It is not necessary to be a yearly subscriber to the magazine.

Anyone may compete who is 16 years of age or over, and a resident of the United States or Canada. Members of the staff of this magazine are, of course, not eligible to enter. Address your letters to Flying Contest No. 10, Modern Mechanics Magazine, 501 Seventh Avenue South, Minneapolis, Minn. Entries must be postmarked not later than July 15, 1930, to be eligible for this contest. Clip or copy the entry blank below and attach it to your letter. Fill in the information requested. Include a snap shot of yourself, if possible—a big photo isn't needed; just a kodak print.

It is not necessary to buy a copy of the magazine to compete. In case of a tie, duplicate prizes will be awarded. Fill in the entry blank, answer the questions and send in your entry now. Don't forget to include your photo!

### *Entry Blank*

My name is .....

Address ..... City ..... State .....

Age ..... Height ..... Weight ..... Sex .....

If under 21, please answer the question below:
Will your parents consent to your learning to fly? Parent's signature .....
Attach your answer to the question, and your photo, to this blank. Mail it before July 15, 1930, to

FLYING CONTEST NO. 10
MODERN MECHANICS MAGAZINE
501 SEVENTH AVE. S., MINNEAPOLIS, MINN.

# Well-Equipped Lincoln Flying School Trains Slemmer

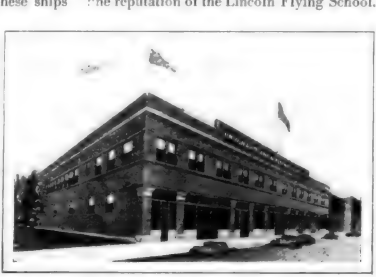
Students from all over the country, instructors, and some of the training planes of the Lincoln Flying School at Lincoln, Nebraska, lined up in front of the hangar to have their pictures taken.

STUDENTS at Lincoln Flying School at Lincoln, Neb., enjoy the advantages of one of the best equipped schools in the country. Lewis Slemmer, winner of MODERN MECHANICS' Flying Contest No. 3, is now taking his flying course at the Lincoln School, and he has been enthusiastically impressed with the completeness of the ground school and the fine array of flying equipment placed at the disposal of students.

Among the planes in which Lincoln School students receive their training are the Barling NB3, famous all-metal low-wing monoplane which in recent months has stepped right up to the fore in popularity as a training ship; the famous Lincoln P. T., unexcelled as a training plane, a biplane noted for its wonderful sturdiness in landing and for its stability in flight; and a seven-place Travel-Air cabin monoplane powered with a 300 h.p. Wright Whirlwind. These ships represent different types of design, and students training in them develop all around piloting skill which will enable them to operate any modern airplane. Every student at the Lincoln School puts in hours in all these different kinds of planes.

The ground school, too, is remarkably well-equipped to give students a thorough knowledge of the fundamentals of airplanes. Wright Whirlwinds, OX5's, and various other types of well-known motors are worked on in the shops by students who learn what makes them tick and how to keep them in running order. And in keeping with the up-to-dateness of the rest of the school, the instructors at Lincoln are men who know how to impart their knowledge to students training under them. Altogether, a *real* flying school—no wonder its graduates hold down some of the most important positions in the aviation industry!

The fact that Lincoln is a "big" school in every way—in size, in adequacy of equipment, in its dealings with students — does not stand in the way of its being one of the friendliest and most hospitable schools in the country. Contest-winner Slemmer has already discovered that Hospitality (he spells it with a capital H) is almost a religion with Lincoln School folks. The minute you arrive at the field you are aware of that right-at-home feeling which, together with the best of equipment and competent instruction, goes a long way to explain the fine reputation of the Lincoln Flying School.



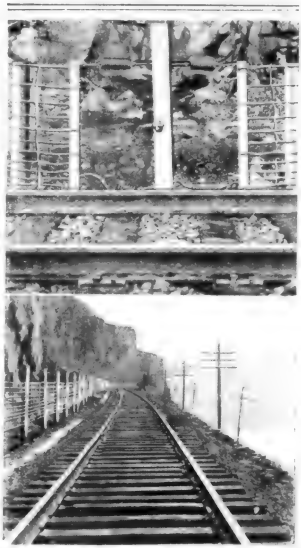
Main offices of the Lincoln Flying School. Everything necessary for the complete training of the pilot is provided.

# Electric Rock Fence Prevents Wrecks From Avalanches

FOR many years the railroads in the deep mountain gorges of the West have had trains wrecked by rocks sliding down these gorges and either knocking the rails out of line or obstructing the track sufficiently to derail the train.

To solve this problem the Union Pacific Railroad has installed a new type of fence for over a hundred miles in Oregon through the Columbia River gorge.

This new electric rock fence is erected between the track and gorge and is held tight with large springs. When a rock rolls down the hill and hits the fence one of the plugs, which are spaced throughout the length of the fence, pulls out, closing the switch which shuts off the electric current and causes the block signal to go on.

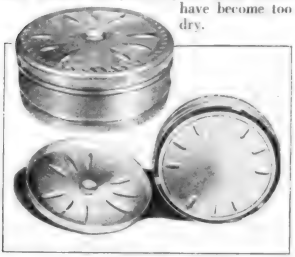


Upper photo shows fence drawn tight with springs. Below: Section of road equipped with fence.

## Filmador Preserves Movie Films

THE Filmador is a new motion picture accessory for keeping films in proper condition for projection. The device is especially interesting to the mechanically inclined from the fact that tremendously important results are secured by the application of the simplest physical principles.

Two aluminum containers, one within the other, comprise the Filmador. Cork pads, cemented on the inside of the outer container, prevent contact between the two and provide a dead air space. A generous humidor pad is mounted beneath an aluminum cover in the bottom of the inner container. Not only will the device preserve films but will restore the pliability to films which have become too dry.

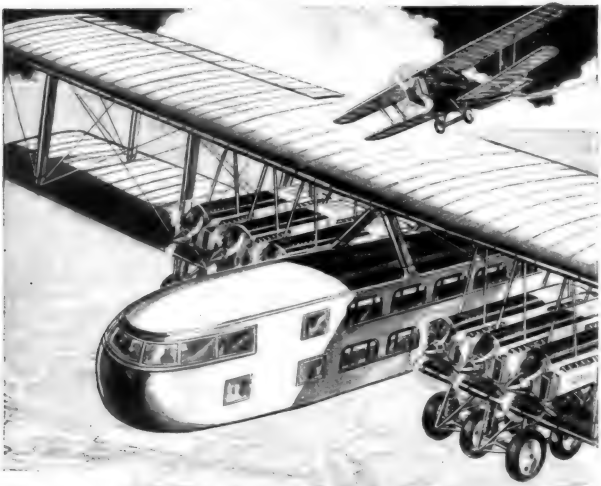


Aluminum container equipped with humidor pads.

## Saving Burned Out Light Bulbs

WHEN your automobile or house lights burn out, don't throw them away until you try the following method: With the current on and the burned out light screwed in tight, give the bulb a light tap with your finger nail; tap from all sides until you see a faint arc inside the light or it lights again. The idea is that the filament inside may be broken, and by vibrating it the two ends hit together and the sudden arc made will nearly always fuse the ends together. But when a section of filament has dropped out it is beyond salvaging. This can be known by hearing the filament drop as the light is turned upside down.

# Building AMERICA'S



Twelve motors will be used in the super airliner, eight of which will keep the giant in the air.

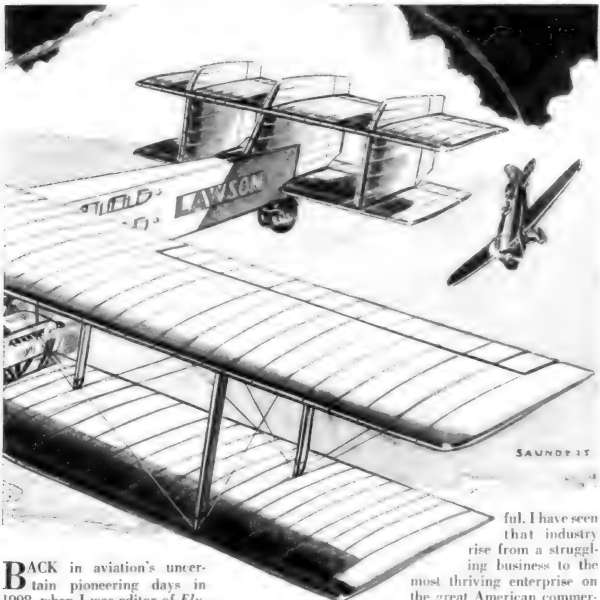
Drawing of the liner now under construction, as the 125-passenger craft will appear in flight.

**Alfred W. Lawson, pioneer figure in aviation, who built the first commercial cabin passenger plane and the first tri-motored ship with heated cabin and sleeping berths, reveals to Modern Mechanics readers his plans for a 125-passenger air liner weighing 50 tons which he is now building in his New Jersey factory.**

EDITOR'S NOTE: *Known as one of aviation's keen-visioned pioneers, Alfred W. Lawson is one of those few men who, back in the earliest days of flying, dared to look into the future and predict that the day was coming when giant ships of the air would carry passengers comfortably, safely, and swiftly to destinations throughout the world. Not content with mere prediction, he has been quietly working out the design of a gigantic passenger airplane which will be the largest in America when completed. In this interview, one of the very few he has ever accorded, he reveals interesting facts concerning his past and present work in aviation, and explains in detail features of his huge 125-passenger air liner.*

# Largest Plane

As told by
ALFRED W. LAWSON
*Famous Airplane Designer*
to ALFRED ALBELLI

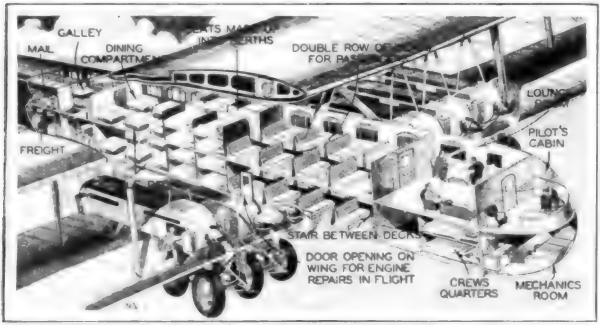



BACK in aviation's uncertain pioneering days in 1908, when I was editor of *Fly*, then the national aeronautical magazine, I was regarded as a prophet of doom. The general public, which is always skeptical at the appearance of engineering innovations, sneered and scoffed at my forecasts for flying. Everywhere I was regarded as a crank. It is a wonder I wasn't condemned to the stake for witch-craft, now that I reflect on turbulent days that have gone.

During the twenty-two years that I have now completed in the field of aviation, sticking tenaciously and doggedly to my theories and principles through periods of time when the future of aviation seemed doubtful, I have seen that industry rise from a struggling business to the most thriving enterprise on the great American commercial scene. Today, no less enthusiastic in my belief in aviation than I was twenty-two years ago, I am the advocate of the air-liner. My disciples are legion, at this time, however. The *Graf Zeppelin's* round-the-world flight, the incarnation, so to speak, of one of my ideas, has demonstrated that my ideas are not so fantastic as they once were thought to be.

Rarely have I come from behind the scenes to be interviewed for publication. My mission and my work in aviation has at all times been that of the quiet producer. On this occasion I have been induced to enter the limelight for a brief moment in

## *Double-Tier Decks Unusual Feature of This Giant Air Liner's Design*




**Interior arrangements of the Lawson air liner include seats and sleeping accommodations for passengers in case of long distance flights, as well as a freight storage section and a mail room where letters are sorted in flight. The double-deck arrangement is a special feature of the liner.**

the interests of the industry which has occupied my attention night and day for twenty-two years. I am pleased to tell about my super air liner and the future which is in store for this branch of aeronautics.

At the present time I am building in my factories at Trenton, New Jersey, an enormous double-tier super air liner which will carry 125 passengers. It is only partly finished and will require another year for completion. It will cost in the vicinity of $500,000.

It was back in 1909 that the first air liner was born in my brain. I saw the idea in the crude Bleriot fuselage. However, it was not until 1919 that the industry had developed sufficiently to allow me to build an air liner. During those intermediate ten years my mind was thinking about big, practical air carriages. At the same time I was quietly accumulating the knowledge and experience necessary to build them.

In 1919 I first demonstrated the practical usage of the air liner in a successful flight from Milwaukee through New York City to Washington and return, personally acting as captain and navigator, and with nothing but a map, a compass and my sense of direction for guidance. On August 27, 1919, without any advance notice, I covered the first lap of the trip from a point ten miles north of Milwaukee to Chicago, a distance of more than 100 miles, in less than an hour.

Betting ran high in Milwaukee that day and few imagined that the weighty machine would ever soar from the earth. They called me a drunkard of dreams. But today I sit back in my offices at 1819 Broadway, New York City, and during odd moments there flash across my mind the spectacles of my types of commercial airplanes flitting across the American and European continents—all dreams which have come true.

When the Lawson 125 seater air liner proves to be the success which I expect, I shall enlarge my factories and build planes of this type in mass production. We will be able to turn them out as fast as flivvers once we get started.

In the latest Lawson air liner now under construction, the front section of the cabin, rounded out to reduce wind resistance, will be devoted to the pilots and mechanics. Two pilots will sit up front at the dual controls. Beneath them space has been provided for the mechanics. They will remain there until some emergency makes it necessary for them to crawl out on the wings to the motors.

On either side of the cabin and half-way

back trap doors have been built in the sides through which the mechanics will pass to reach the engines. It will not be necessary for the ship to descend to make repairs.

Directly behind the extreme front compartment and next to the cabin are the offi-

**Fuselage section, partly completed in Mr. Lawson's New Jersey factory. Compare size with seated figures.**

**Alfred W. Lawson, designer of the plane.**

cers' quarters, where the conductor can count his tickets and discuss with the pilots whether or not they will arrive on time.

The next section is the main passenger cabin itself. There is an aisle through the center and double seats on both sides. Above is another tier of seats which are reached by steps located at intervals. Inside, the cabin resembles the ordinary Pullman car made up for the night, except that seats take the place of berths.

The passengers will make the trips in chairs, although the liner can be converted into a sleeper in two hours. A porter in the customary white coat will serve light lunches and put up tables between seats for card games, or for passengers who elect to spend the time writing letters.

The compartment behind the cabin will be used for freight and mail and the sorting of mail during the trip. Two lavatories will be installed in this part of the ship.

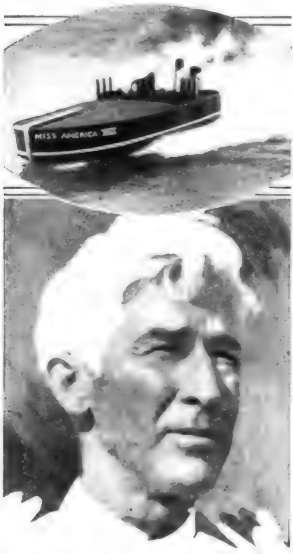
The ship will be equipped with twelve motors. Only eight of them will be necessary to keep the plane, weighing fifty tons, in the air. Each of these motors will develop 400 horsepower. The four reserve motors will insure the safety of the ship.

Six men as a crew will be all that will be needed to man the new Lawson super air liner, so the operating expenses will be low. By the way, the fuselage is 100 feet long and the wing spread is 200 feet wide. As I designed this giant airplane, I had in mind not only safety and economy but also speed. I have calculated that my ship will make 100 miles an hour easily and steadily.

When I speak of air transportation, and it is my remotest notion ever to over-leap the bounds of modesty, I unhesitatingly say that I know whereof I speak. In 1913 I was christened the first air commuter when I flew daily from my New Jersey home to my New York office. In 1918 I built the first commercial cabin passenger plane, in which people could actually stand up and walk around. In 1920 I built the first three-engine air liner with sleeping berths, heated cabin and mail chutes.

And if I may be permitted another admission, those who have followed the glowing pages of aviation's history will recall that on August 10, 1918, I appeared before War Department officials and proposed a trans-oceanic float system, installing landing stations in relays along the route from America to Europe. Today such a float system is actually in the course of construction.

# Gar Wood Seeks 100 m. p. h. Mark




Gar Wood, dean of speedboat makers, is shown above with his latest racer, Miss America VIII.

ONE hundred miles an hour has long been the goal of speedboat racers. This goal was almost reached last year when Gar Wood, the veteran power-boat designer and racer, reached the amazing speed of 93.123 m.p.h. at Miami, the present world's record.

Wood will make a new assault on the century mark with his new hydroplane, the *Miss America VIII*, which is the newest and fastest of the many speedy racers he has developed. Wood first came into prominence as a speedboat racer and designer when he entered the Detroit Regatta in 1916 and walked off with most of the honors in his *Baby Gar* and *Miss Detroit*. He plans to retire as soon as he has passed the 100-mile mark.

## Type Metal Makes Good Bearings

TYPE metal such as is used by linotypers in publishing houses for casting type may be used successfully for making light high-speed bearings which may become heated. This metal is composed of eighty per cent lead and twenty per cent antimony. Only the highest quality of type metal should be used for this purpose.

This metal should be used only for the lining of the bearings in place of the more expensive babbitt metals which contain copper and tin. Additional strength may be obtained by combining the type metal with babbitt metal, but these bearings should not be used when heavy loads must be carried by the shafts. The metal may be obtained from any type foundry.

## Reducing San Francisco Grade Makes Detour a Main Traffic Artery

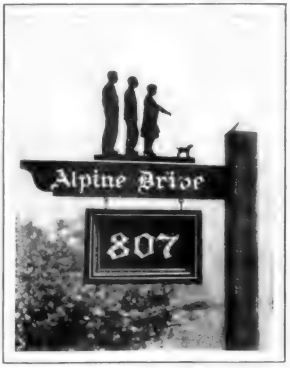
GRADE is a more important matter in connection with roadways than with sidewalks. The grade of this San Francisco street was so steep that automobiles and street cars found it almost impossible to negotiate in wet weather, so the city and railway company shared the cost of remedying this by cutting down the roadway grade from 14.4 per cent to 10 per cent. The maximum depth of cut was 15 feet. The sidewalks were not lowered.

Sidewalk stairways save San Francisco hillside property values.

# Silhouettes of Family Add Individuality to Signpost

A HIGHLY individualistic signpost indicating the street and house number, and in addition giving some hint as to the number and physical nature of the inhabitants, is to be found stationed before the Hollywood home of Jimmy Gleason, the famous movie actor and jokester.

The chief feature of this signpost, pictured below the silhouettes of the family, can be made by drawing full length profiles of the members and tracing around the images on a sheet of fairly thick copper or galvanized iron. The design is then cut out with a pair of tinsnips, and a coat of black paint applied to preserve the metal and give sharper outline to the images.




**Silhouettes of family cut on metal from photo give distinction to this signpost.**

## A Pencil in a Miniature Bottle

A CHICAGO firm is now manufacturing novelty pencils in the form of bottles. In the one pictured above, pressure at the bottom pushes out the pencil point at the top, a mere touch of the finger being all that is necessary to make the pencil ready for writing. Other designs combine pencils with cigar and cigarette lighters.

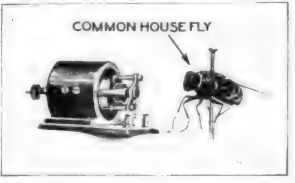
**Light pressure on the bottom of this miniature bottle converts it into a pencil ready for use.**

## Switzerland Most Inventive Nation

SWITZERLAND is the most inventive nation in the world, with Germany, France, Great Britain, and the United States following in the respective positions of third, fourth, fifth and sixth, is the belief of an eminent scientist. No nation is mentioned as occupying the position of second. The scientist attributes the superior ingenuity of the Swiss people to the great influx of intelligent refugees into that nation, but fails to attach any importance to the simplicity and cheapness of registering patents.

## Motor No Taller Than House Fly

AN ELECTRIC motor which is no taller than half the height of a dime, and which is now rated as the world's tiniest motor, has recently been completed by Emanuel Kahn, electrician and watchmaker of Friend, Nebraska. Some idea as to its smallness may be gained by comparing it with the common housefly in the photo below. Three years were required in the making and assembling of the parts, which comprise fifty-eight pieces of gold, silver, copper, and iron. A watchmaker's eyeglass was used in the construction of the motor, owing to the smallness of the parts.




**The world's tiniest motor, pictured above, is no larger than a fly and has a speed of 2400 R.P.M.**

# Pointers for the Angler

By EARLE W. GAGE

**How to catch fighting game fish—what lures to use—how to entice the big fellows onto your hook—the fine points of casting—equipment favored by most successful anglers.**

WHEN the warmth of spring is in the air, the lure of the rod draws the thoughts of millions of anglers irresistibly to clear trout pools and rock-rimmed bass haunts.

The angler's outfit is important in most waters, and it is easier to start right than wrong. It is more enjoyable and sportsmanlike to use the casting outfit, which need not be costly. The short steel or split bamboo rod is best for the beginner. Not over 5 or 5½ feet in length, this rod permits casting as far as necessary, and is easier to use. Control is more important than distance; ability to hit the mark with the lure is worth much more than unreeling lots of line.

The 80-yard reel is best, of the quadruple multiplying variety, in which the spool revolves four times for each turn of the handle. This takes the line rapidly, especially when the spool starts to fill.

For brook trout, the 50-yard soft-braided silk line, size G, is best. This stows on the 80-yard reel with space to spare, which is important in casting. The line should be dried after each trip to the brook.

There are many artificial lures, or "plugs." They should cast easily and be of striking color. In shape the "shovel-nose" is as good as any. In color, red and white or green is good. The surface-underwater type is superior to the underwater kind; this keeps on the surface until drawn under, when it submerges. Such lure does not snag on the bottom if left alone, and will attract all kinds of fish.

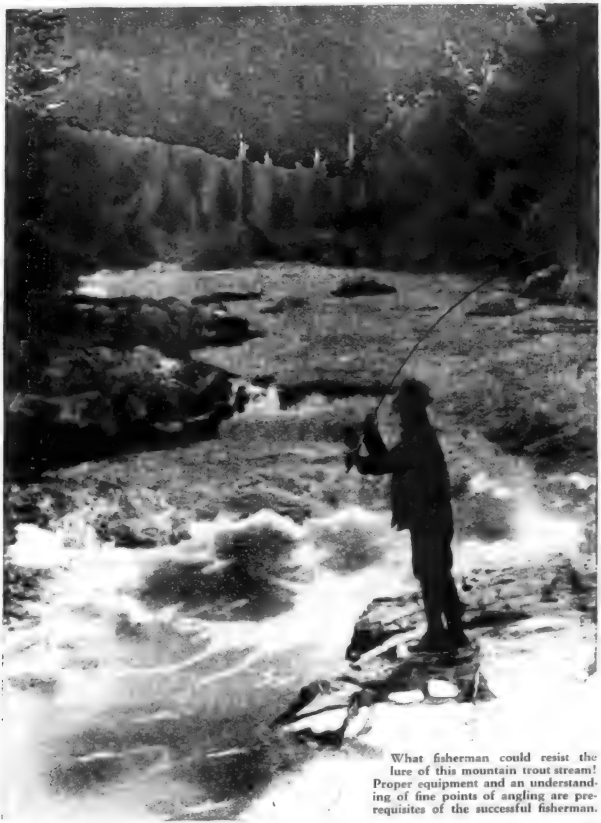
Casting is an art, as any one who has tried well knows. There are three motions—the "raise," the "cast," and "spooling" in line. Hold the rod in the right hand with the reel uppermost, your thumb pressing down on the spool and your fingers underneath and gripping the rod. Have the tip of the rod pointing straight ahead. Now quickly bring the rod up and back until it points slightly behind the head. With a smart, snappy motion bring the rod down to a horizontal, or nearly horizontal, position, at the same time release the pressure of the thumb on the reel to permit the spool to revolve. Out shoots the lure.

But be careful not to release too much line, and do not remove too much pressure or you will have a tangle caused by "backlash." Bring the flying lure to a stop by bringing the thumb down sharply on the spool. Now change the rod to the left hand and grasp the reel seat with the fingers, so that the thumb can guide the line on the reel. Turn the crank with the thumb and forefinger of the right hand. Those simple motions are the rudiments of casting.

**Thumbing the reel is the whole secret of successful casting. Too much pressure stops the cast too soon; too little is likely to cause a backlash.**

Even with "a fool on one end and a worm on the other," it is simple to make the most cunning of fish take the worm when the brook is in flood. But to outwit the trout when the current is clear is a fine art, especially when done with an angleworm.

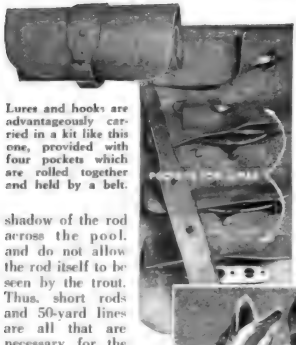
The essentials of clear-water worm-fishing of early spring are a short, stiffish rod, the finest gut or hair casts, some bright, rather small worms, and—



**What fisherman could resist the lure of this mountain trout stream! Proper equipment and an understanding of fine points of angling are prerequisites of the successful fisherman.**

most important of all—full realization that one must keep out of sight and be as quiet as possible.

Always work up stream; the best trout are not lying at the tail of the pool, and, having dropped the bait into broken water, let it drift naturally with the current toward you. If the sun is bright, avoid casting the



Lures and hooks are advantageously carried in a kit like this one, provided with four pockets which are rolled together and held by a belt.

shadow of the rod across the pool, and do not allow the rod itself to be seen by the trout. Thus, short rods and 50-yard lines are all that are necessary for the brook work.

With the light rod and three-foot cast, at the end of which is a single fly—black spider, claret or dun—you crawl through moss and breather until within reach of the narrow, but deep brook. Now wait until a dimple marks the rising of a good fish and softly let your fly and not the gut, up stream. Usually there will be an instantaneous rise and with the exercise of a little patience and skill, that fish is yours.

In going after the lake trout, early morning fishing from a 18-foot canoe, with a paddler to keep her going and assist in landing, is rare sport. Have the paddler set a pace of two miles an hour, even, easy strokes. Take a course off-shore, let the spinner run out not less than 100 feet of line and have it arranged so the lure travels on a level not less than twelve or more than twenty feet below the surface.

When you get a tug of a captive eight or ten-pounder, strike him with your hand, let the line slide gradually out and, when it is taut, start playing with the butt and reel. The weight of the bait will then be submerged in the fighting of the fish, when you should remember the limit of your line; if it reaches the limit, the rod is broken and the fish gone, since no leader can hold the fighting lake trout of goodly size, while the resilient bamboo can, and easily.

Instantly Mr. Trout discovers that he has become the butt of a ghastly joke, if your muscles act quickly enough, you strike him before he can disgorge the morsel and drop back to rest, a wiser fish. Strike instantly and you set the hook and now it's up to you to land him.

Set your thumb on the reel and let him have the line as slowly as safety permits. But keep it taut. The moment he rushes ahead and the line shows signs of slackening, you are in danger of losing him. The paddler should keep the nose of the canoe pointed toward the quarry, since a large lake trout on the end of a long line may overturn your craft.

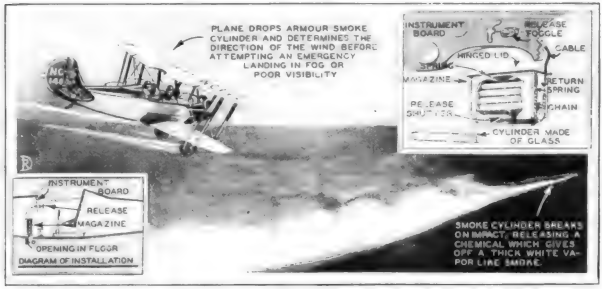
Minnows are the lure of lake trout and similar large fish. The lure must be silvery scaled and belly white, four inches in length, but no more. Fly fishing for bass is real sport, too. Almost any plug or wooden minnow will attract these scrappy, red-eyed fighters. Record strikes are usually made with small lures. Use light flies on dark days and dark flies on bright days.

This fisherman's smile is amply explained by the muskie he has caught.

A steel casting rod.

A rod of the split bamboo type.

# New Device Helps Pilots Judge Wind Direction in Flight




**Chemically filled glass cylinders emit clouds of smoke-like vapor to provide pilots with an accurate wind indicator for use when visibility is bad. Colored smoke is released on contact with snow.**

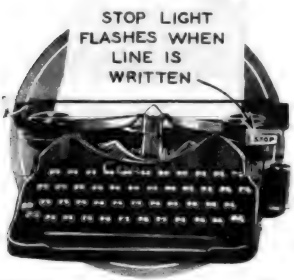
ALMOST every pilot has experienced difficulty in finding the exact wind direction. In the case of a forced landing in foggy weather or in gathering darkness it becomes a serious problem. A new invention, the Armour Wind-Direction Indicator, entirely removes this hazard.

The device is simple and compact. A magazine containing six glass cylinders is placed in the cockpit, a release gear allowing the cylinders to be dropped through an aperture in the floor when desired. The cylinders contain a chemical compound and when dropped from a plane break, releasing the chemical which in contact with the air gives off a heavy smoke.

At the base of the magazine is a semi-tubular shutter operated by a chain and sprocket connected by a cable to a toggle on the instrument board. To release a cylinder the toggle is pulled. This rotates the shutter, allowing a cylinder to fall and another one to move into place.

The contents are non-inflammable and may be dropped without risk of damaging property or crops.

## Unique Stop Light Replaces Bell as Typewriter End-of-Line Indicator




**Flashlight batteries operate this small stoplight.**

THE typewriter shown has a novel method of indicating when the carriage should be returned. Instead of the conventional bell, the typist is greeted by the flashing of a light located on the frame of the machine. The light consists of a flashlight bulb which is housed in a suitable container with a glass face upon which the word "stop" has been printed. One side of the circuit is grounded on the machine, the other goes from the bulb through the batteries to a switch on the rear of the typewriter which operates on the carriage margin indicator.

The use of such a device on typewriters in noisy offices where it is difficult to hear the ring of the small bell, should prove to be helpful. It should certainly eliminate a great number of mistakes.

# Chicago to Have World's Most Powerful Aerial Beacon

A diagram of the projection of the powerful "Lindbergh Beacon" light across the horizon and its height at a point 300 miles away.

Palmolive building where the beacon is to be located.

A TWO billion candle power high intensity arc light, the biggest lamp ever mounted as an aerial beacon, soon will be projecting its beam into the sky from a tower atop one of Chicago's tallest skyscrapers. The light, the gift of its inventor, Elmer A. Sperry, famous inventor of the high intensity arc, the gyroscopic compass, gyroscopic helmsman, is to be named the "Lindbergh Beacon," as a permanent memorial to the colonel's famous one-man flight to Paris.

Aviators flying in the neighborhood of Milwaukee, north of Chicago, or St. Joseph, Mich., on the east shore of Lake Michigan, will be able to read their newspapers by the beam. In tests of the big light made from the ground recently an aviator flying down the beam was able to read the New York Times when fifty miles away from the light.

On its lofty perch atop the 37 story Palmolive building the light, which has an eighty inch lens, will be 603 feet above the street. It is to be mounted on a steel tower more than 100 feet high, the sides of the tower encased in gleaming aluminum.

To avoid blinding people on the ground, the light is to be pitched two degrees above the horizon. At 300 miles, or about the vicinity of Cleveland, the light will be approximately 39,000 feet above the earth, owing to its pitch and to the curvature of the earth. Further on it will be lost in space, and no one probably, will ever see its extreme range of 500 miles.

In experimenting Mr. Sperry had to find an electrical conductor with a higher melting point than carbon, and carbide in a molten form was the answer. Carbon melts at 2800 degrees and carbide at 5000. A way was devised of using the two elements; a carbon electrode was brought into contact with a pool of molten carbide; and the result was an arc light of extremely high intensity.

A mammoth light of the "Lindbergh Beacon" type.

# Lipton Again Challenges America's Cup

THE America's Cup, which has been in possession of the New York Yacht Club since it was first won by the obscure pilot boat, *America*, in 1851, will be challenged again this summer by Sir Thomas Lipton, who will try to take it back to England after nearly eighty years on this side of the Atlantic.

Lipton, who has been challenging consistently but unsuccessfully since 1899, will soon launch the latest of his speedy yachts, *Shamrock V*, to challenge the supremacy of American designers; while on this side four yachts are being built to defend the cup.

*Shamrock IV* was regarded as a freak vessel. She carried over 10,000 feet of sail, had an overall length of 110 feet, drew 27 feet of water, and had many unusual features including a very bluff bow, a hogged shear, extraordinarily heavy chain plates and about 65 tons of lead in her keel.

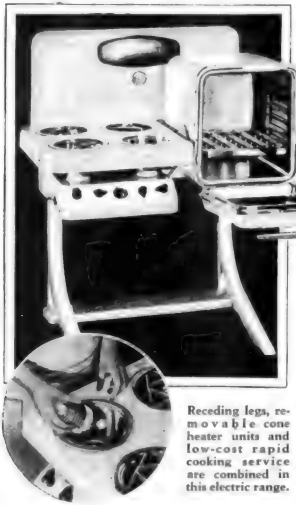
The new *Shamrock* is to be of different mould. Instead of the old club topsail rig she will carry a jib-headed mainsail more like a Bermuda rig, with only one or two head sails and much less sail area. She will be but 77 feet in length.

Shamrock IV, with which Sir Thomas Lipton tried to lift the cup in 1920, is shown above in action. The new Shamrock differs radically from this yacht, being lighter and carrying less sail.

## Ancient British Battle Queen Dwarfed Beside the Latest Fighting Craft

H.M.S. Victory, Lord Nelson's flagship at Trafalgar, is shown beside the U.S.S. Saratoga on her recent tour. Insert shows how the former queen of the seas compares in size with today's warships.

# Household Tasks Made Lighter



Receding legs, removable cone heater units and low-cost rapid cooking service are combined in this electric range.

IN THEIR steady march forward, inventive minds are not overlooking the fact that the home manager's tasks can be simplified by the introduction of time and labor saving devices.

Of recent interest is an electric cooker that combines low operating costs and speedy cooking with inverted easy-to-get-under legs and removable cones that weigh more than a pound less than old style heating units. It is a range of ample capacity, while the rounded corners and enamel finish make cleaning easy.

## Finger Pads for Baby's Teeth

TO CARE for Baby's teeth, a physician recently introduced a gum cream and sanitary finger applicator. The cream and finger pads are packed in a metal kit handy for daily use. The applicators can be sterilized and used many times. They come packed eight to a box together with a specially prepared cream for Baby's teeth, which will not irritate the tender gums.

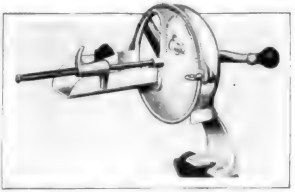
A handy fingertip applicator for cleaning teeth.

## Wallet Protected by Belt Chain

A pickpocket-proof wallet that fastens to the belt and cannot be lost.

THE wallet illustrated is the outgrowth of a man's impatience. After having forfeited his pocketbook to pickpockets two or three times he devised the purse with the chain attachment for his belt, which cannot be detached without the owner's knowledge. It makes an inexpensive bridge prize or gift and fits the hip pocket snugly.

## Slicer Speeds Vegetable Cutting



Slicer cuts fruits and vegetables fast and uniform. It clamps to the table and is easily cleaned.

Slicing vegetables or fruit has come under the scrutiny of inventors as this slicer illustrates. It will turn a bushel of potatoes into Saratoga chips in 25 minutes. The

# by Invention's Steady March

slicer fastens to the table with a clamp. A corrugated feed plate carries the vegetable to the blade.

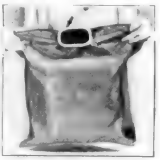
## Bottle Covering For Your Milk

An asbestos-like shield to protect milk from the sun.

SHAPED like a bottle, the asbestos-like hood shown protects your milk from the rays of the sun. It keeps the milk cool and prevents it from becoming contaminated by flying dust or inquisitive cats or dogs. The device is comparatively inexpensive, and several metropolitan milk dealers plan to adopt it for the protection of their customers. It may be easily washed.

## Self-Filling Air Pillow Invented

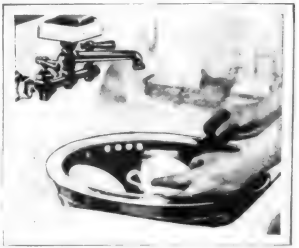
WITH the coming of summer trips this air pillow is not a bad suggestion. This one embodies rather a unique idea in that it inflates itself and that it can be used as a waterproof pocket for those little odds and ends that you want to keep dry at the beach or camp. It has a hundred uses and folds down into the size of a handkerchief when not in use.



A self-inflating air pillow that has many uses.

## Housewife Designs New Dish Pan

A DISHPAN that doesn't splash water! Many homemakers have wished for the same thing time and again and now it is a reality. Here is shown one that saves the



This splashless dishpan has turned-under edges and overflow holes to protect clothing and floor.

clothing and the floor by keeping the water where it belongs. The edges of the pan are rolled under and drain holes are spotted around the sides. The idea was introduced by Mrs. Ann Urquhart of Woolaston, Mass.

## Hydrator For Electric Icebox

This porcelain enameled compartment is intended for the electrical icebox and provides a moist place for perishable vegetables and other foods. It is now standard equipment on several refrigerators.

Moist air compartment for preserving vegetables.

# Build Your Own Garage

Framing the windows of the garage.

**Now that so many families operate more than one car, the modern home can scarcely be considered up-to-date without a double garage. Modern Mechanics has designed a two-car garage, as described in this how-to-build-it article, which has provision for accommodating a sizeable workshop as well as a pair of automobiles. You can build it from the plans given herewith.**

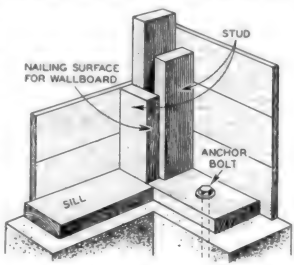
IN THESE days of home-built outboard cruisers, home-built gliders, home-built racing cars and similar large work projects, a roomy, light and serviceable workshop is one of the first needs. The cellar workshop is out of date, if for no other reason than the sad experience of the man who built the cabin cruiser in the basement and then had to jack up the house and knock out a wall to get the boat out. So MODERN MECHANICS has designed a combination two-car garage, big enough to house the family bus and a good sized workshop, with room to assemble anything up to a 19′ 6″ boat without opening the doors, and always convertible into a double garage when needed.

This month we are going to tell how to build the garage-workshop yourself in your spare time. Next month we'll describe the workbenches, tool cabinets, supply shelves and other equipment, and suggest a range of power tools for every job.

The accompanying drawings give all the information your lumber yard will need to figure the bill of materials.

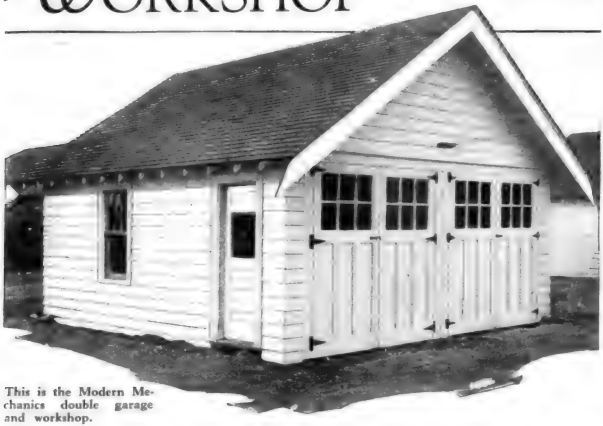
The garage is 20 ft. square, which, with cars around 120 inch wheelbase, gives room to do quite a bit of work even with two cars on the floor, while with one out you have a shop of really generous proportions.

The foundations are 12″ thick, of poured concrete, extending down below the frost line—which varies in different latitudes. An 8″ thick extension above the grade line, 8″ high, carries 15 iron bolts, ¾″x8″, set in the soft concrete to extend three inches above its surface. The floor is 5″ thick, four inches of rough concrete and one inch of surface smooth coat. A bed of cinders 4 to 6 inches thick beneath the floor will improve it. The floor slopes slightly toward the front, and ends in a 2-foot apron, slop-




Detail showing how corner of garage is erected.

# WORKSHOP *by* JAY EARLE MILLER



**This is the Modern Mechanics double garage and workshop.**

ing sharply down to the grade level, as shown in the detail drawing.

The first step is to lay out the foundation lines and square them with the 6-8-10 hypotenuse. If you measure 6 ft. from the corner, stick a pin through the line, measure 8 ft. from the corner down the other side, and stick another pin through the line, you can square the lines to a right angle by holding a ten-foot pole or ten feet of tape measure between the pins. Preliminary stakes are set out and after the first lines are placed batter boards, nailed to stakes, carry the second lines to mark the inside of the foundation.

The wall is poured in solid earth below grade, the wall being 12″ thick, and between wooden forms for 8″ above grade, this portion being 8″ thick. While the 8″ wall is still soft set the 15 bolts, as shown in the detail drawings.

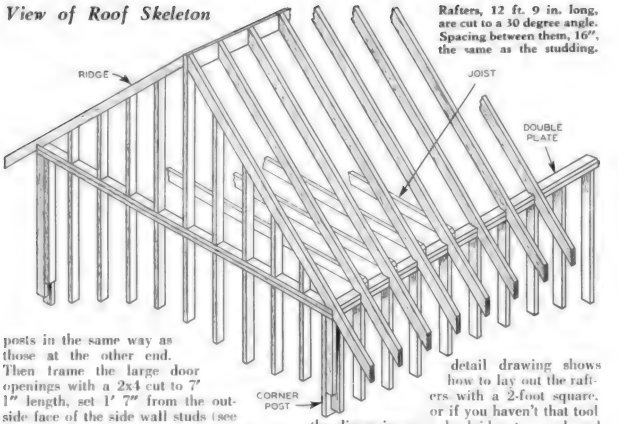
The sill is made from 2x4 studdings, half lapped at the corners, and drilled at the proper intervals to fit the bolts. The corner posts, shown in a separate drawing, are built up from three 2x4's, two set an inch apart, and the third spiked across their end faces, as shown. This gives a nailing angle on the inside for a wall board lining.

The top plate, as shown in the detail drawings, is built up of two 2x4's spiked together, half lapped at the corners.

If you have plenty of help available to raise the wall it is possible to frame each side on the ground, and then lift it into place, but working alone the best way is to bolt down the sills and erect a corner 2x4, holding it with light wood strips nailed at angles down each wall to the sill. Square it up with a level or a plumb bob until it is vertical in both planes, then secure the bracing strips and proceed to the next corner. Place a 20 ft. stud on top of the corner posts, nail it down, and set the rest of the studding along the side, spacing them 16″ on centers. After they have been secured by nailing down through the plate, the top half of the plate is spiked in place. It is cut shorter by the breadth of two 2x4's, so the top half of the end plates can be half-lapped.

At the garage door end build the corner

## *View of Roof Skeleton*




**Rafters, 12 ft. 9 in. long, are cut to a 30 degree angle. Spacing between them, 16″, the same as the studding.**

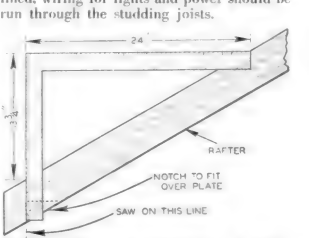
posts in the same way as those at the other end. Then frame the large door openings with a 2x4 cut to 7′ 1″ length, set 1′ 7″ from the outside face of the side wall studs (see detail). Next to this set a 2x4, the center of which is 4½″ from the door jamb, carrying the stud up to the roof boards and notching it into the rafter. Between the doors set two double 2x4 studs 7′ 1″ in length. These are placed so that the door jambs are 10″ apart (see detail). On top of the 7′ 1″ studs set a double 2″x 8″ header extending over to the next stud, where it can be spiked through the ends. The studs that form the gable are set on top of the header. Around the inside of the door openings set a 3x¾ facing which will serve as a door stop and also a door jamb. The doors are 7′ 6″ high, but the studs that frame them must be cut to 7′ 1″ as the 2″ bottom still rests on the foundation, which is 2″ above the floor at the door end and 1″ at the other end, and the door sill has a 1″ drop.

At the other end the gable studs are framed as shown in Fig. 6. A 2x8 ridge runs the length of the building, set on top of the center studding. Length of the other gable studding can best be determined by cutting a rafter and placing it, then fitting the studding beneath.

The rafters are 2x4, spaced, like the studding, 16″ between centers. Their length is 12′0″ and they are cut at a 30 degree angle, or a 12″ run and a 6⅞″ rise. A detail drawing shows how to lay out the rafters with a 2-foot square, or if you haven't that tool the dimensions can be laid out on a board or a piece of paper. Rough 1x6 sheathing, covered either with shingles or a composition roofing is recommended for the roof.

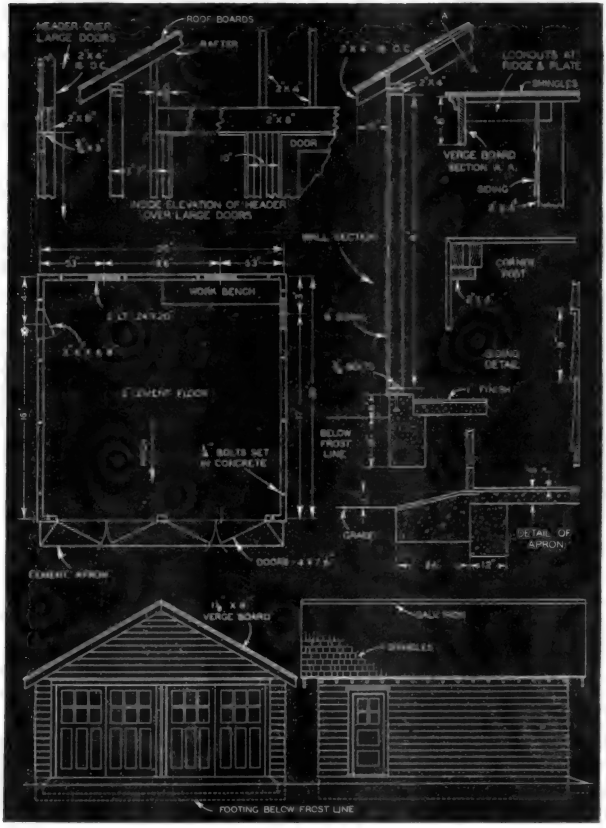
Only two end windows and one on the side are shown. More can be installed if desired, and over the workbenches higher and smaller windows are to be preferred. Those shown are 2-light, 24x20 in size. The sill of the workbench windows should be at least 10″ above the bench tops to leave room for tool racks below them.

The side walls can be covered either with siding, over building paper, or sheathing and shingles. If the inner wall is to be lined, wiring for lights and power should be run through the studding joists.




**Here's simplest way of cutting rafters to shape.**

## *Floor Plan, Corner Details, Door Header Construction, Shown in Print*




Essential dimensions of the garage are given in this blueprint. Note disposition of the bolts set in concrete foundation, to anchor the sidewalls. Cedar or composition shingles, or flat roll type roofing, may be used to cover the roof as individual preference may dictate, usually to match the house.

Edited by MAJOR H. H. ARNOLD

## When Is a Pilot Justified in Jumping From His Airplane?

TO JUMP or not to jump—that is one of the most difficult questions a parachute-equipped airplane pilot ever has to decide for himself when something goes wrong with his ship and he doesn't know if he can land safely in it or not. When a pilot decides to jump, he automatically assumes the responsibility for the complete destruction of an airplane valued anywhere from five to a hundred thousand dollars. Once he leaves his plane, he knows he must answer some very pertinent questions when he comes to the ground. In addition to the almost certain destruction of his plane, there is another thought to give pause to the pilot, and that is the possibility that his parachute may not open or may become entangled in the parts of the plane.

Every pilot hates to return to his home airport without his plane. If he jumps because of thick fog in mountain country and some fellow pilot succeeds in getting through when he failed, then the pilot who jumps has to admit that the airman who got through successfully is the better pilot—an admission which just naturally goes against the grain of any flyer.

Frequently, too, the pilot has passengers to think of. Like the captain of an ocean liner, an airplane pilot will not leave his ship until all passengers are safe. As long as a passenger remains in the plane and there is the remotest possibility of getting the ship down safely, the pilot sticks with his ship.

There are times when a pilot finds himself drifting to earth under a parachute without having done any thinking about it whatsoever. An army lieutenant, flying in the Philippines, flipped his plane over on its back. His safety belt broke and he was hurtled out into space almost before he knew it. The only thing to do then was to pull the rip cord of his 'chute, which enabled him to write a happy ending to the story.

MAJOR H. H. ARNOLD
The editor of Plane Talk, who edits this popular department of Modern Mechanics, was the official government observer at the early flight demonstrations of the Wright brothers, and a personal friend of the inventors. His aviation department appears here regularly each month.

Test pilots have been known to leave the ground with the intention of flying a plane to complete destruction, putting it through maneuvers to exert the greatest possible strain on the ship. These men know before they leave the ground that in all probability they will have to jump. However, in some instances they have brought planes back to earth in such crippled condition that the most critical could not have condemned them for taking French leave of the craft in the air. A good pilot sticks with his ship until he is forced to jump.

# Double-Deck Airplane Ambulance Carries Two Patients

BECAUSE they can reach isolated places quickly at a time when speed may mean the difference between life and death, airplane ambulances have been in use for some time. The U. S. Army is equipped with a number of ambulance planes, one of the newer models being shown in the photos herewith.

Litters are provided for carrying two patients, one being slung above the other in the fuselage in a double-deck arrangement. Extra-wide doors open into the fuselage side to permit them to be set in place with a minimum of twisting and jarring movements which might prove painful to the patients. A crew of three is carried in the ambulance plane—the pilot, a medical corps attendant who rides alongside the pilot, and the medical officer who rides inside the cabin with his charges.

Room for two patients with a medical attendant, in addition to the pilot, is provided in these double-deck hospital planes used by the U. S. Army. The red cross stands out conspicuously on plane in flight.

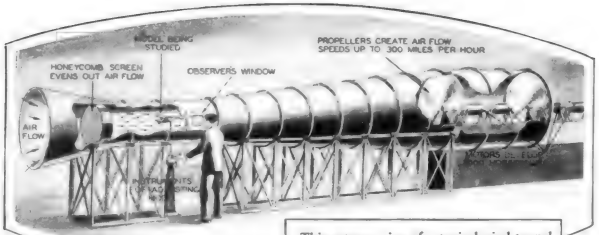
In addition to first aid equipment, the ambulance carries a special tool kit for extricating passengers from wrecked airplanes. Included in this kit are hack saws to cut away metal braces, struts, and wires; axes to knock obstructions clear; files to cut through wires; heavy wire cutters—in fact, tools of every kind and description required to get at a pilot who might be held fast in a wreck.

In actual practice the aerial ambulance has proved its efficiency. In transporting patients over long distances it is greatly to be preferred over any other means of transportation, since there are no jolts or jars.

## New Control Indicator

AN indicator which uses small electric lights to warn the pilot when he is deviating from a straight flying line has been developed by the Vickers company, the well-known British airplane manufacturers. One row of small lights is for aileron indication, lights flashing on at the left end of the row when the left wing drops, and vice versa. Action of the lights is controlled by mercury in a U-shaped tube. The mercury shifts position when the plane departs from level keel, completing electric circuits which cause the lights to flash.

A similar row of lights controlled by a gyro unit operated by an air jet flashes a warning when the ship drifts to right or left of its true course. An air speed indicator tells whether the ship's nose is pointing upward or downward, informing the pilot how to operate his elevator controls. When the nose points upward a decrease of speed is shown, with an increase indicated when the nose dips down. Every indication necessary to enable the pilot to maintain a straight and steady course is thus provided.




This cutaway view of a typical wind tunnel shows how it narrows at the point where the model is suspended in order to create high wind speeds. The honeycomb screen smoothes out "bumps" in the air.

Model wing sections are shown at right.

Cigar - shaped objects at left are model dirigibles.

Models used in tunnel tests are built up out of exact scale parts, a number of which are shown above. At the left is a typical model fuselage which has been suspended in a wind tunnel filled with smoke so that the air flow will leave visible traces.

Prediction of airplane performance is made through wind tunnel tests using small model planes.

# Wind Tunnel Tests Foretell Performance of Airplanes

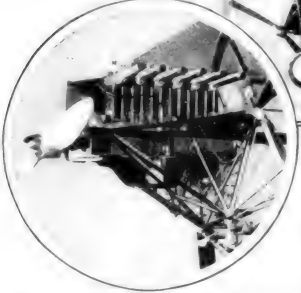
MODEL airplanes, made exactly in proportion to full size ships, enable aeronautical engineers to predict the performance of untried planes by watching the behavior of the models when suspended in wind tunnels. A wind tunnel is essentially a long, smooth tube through which air is forced by propellers at speeds of from 30 to 300 miles an hour. Models to be tested are suspended inside the tunnel and their reaction to the air blast recorded on instruments placed convenient to an observer who watches the experiments through a window.

Performance, control, and pitching, rolling, and yawing moments are secured from models. Results obtained from tunnel tests must be carefully interpreted, since the coefficients obtained on a model may be entirely out of proportion to those existing on the full size plane. For instance, the coefficient for drag on a strut may be many times greater on the model than in the full-sized plane. Similar discrepancies mounting up with various parts make tunnel tests worthless unless compensated for. Consequently models are usually used in which struts, wires, fittings and other parts which show excessive readings have been omitted. When the tests are completed a coefficient is used which includes the sum of all omitted parts.

Results obtained are quite accurate. The prediction obtained for high speed usually varies only 1% to 3% from that obtained in actual flight tests made by the airplane. By introducing smoke into the wind tunnel the flow of air around a model can be photographed and improperly designed units such as radiators or landing wheels which cause turbulent or boiling eddies can be corrected. Wind tunnel tests were largely responsible for eliminating much of the inefficient design of old-time planes. Fittings, struts, wires, landing wheels and control pulleys are now either streamlined or concealed within the structure of the plane. It is not uncommon now to see planes in which all protruding parts are streamlined.

## Engine Transferred From Automobile Flies Plane Without Alterations

LIFTING the engine out of a stock automobile, fitting it into a stock airplane, and flying the plane successfully, was the interesting feat performed recently at the municipal airport, Dayton, Ohio. It was possible because the engine was the air-cooled motor of a new Franklin car, and hence there was no radiator and cooling system to bother with. The automobile was driven to the field under its own power, mechanics disconnected the controls, hoisted the engine out, and swung it onto the engine bed of a Waco biplane. Controls were hooked up, the engine bolted down, cowling designed for it added, and, while the spectators watched, the plane took off after a surprisingly short run and performed excellently.

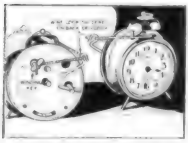


The auto engine shown in circle flew this plane.

# HANDIKINKS

**Everybody can make use of one or more of the dozens of practical ideas presented on these pages. All of them are simple so that you can easily apply them to your own purpose, and all of them are worthwhile time savers which have proved useful in actual service.**

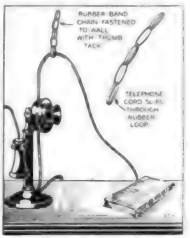
## *Alarm Clock Turns Self Off Automatically After Awakening Sleeper*



MOST alarm clocks ring for a minute or longer before running down—more time than is required to awaken the heaviest sleeper. To prevent the annoyance of continued ringing after you are awake, the simple contrivance shown at the left will prove effective. A wire loop is soldered to the back of the clock as shown, and a cord tied to the alarm winding key, running through the loop to the alarm shut-off lever. When the alarm goes off the cord is wound up and the lever moved to off position.—Frank Moore.

## *Rubber Band Chain Protects Extension Cord*

IN OFFICES where two flat-top desks are set back to back, it frequently happens that one phone is made to serve both desks. This necessitates a long extension cord on the phone, which soon becomes worn unless some means is employed to protect it. One simple expedient is shown in the drawing at the right, in which the cord is suspended at its midpoint with a chain of rubber bands. Ordinary rubber binders are looped or tied together until of sufficient length to keep the cord off the desk. —Lester P. Young.



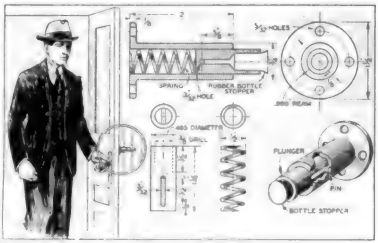

## *Steps for the Lake Cabin*

A CABIN or cottage located at the top of a steep bank or knoll requires some sort of steps to make it easy of access. A satisfactory stairway can easily be made from the trunk of a dead tree that has blown down in the vicinity. Drag the log in place and imbed it solidly in the ground. Then, using an axe or saw, steps can easily be cut in the trunk. Long willow poles resting on crotched sticks driven into the ground at intervals along the stairway make an effective railing, bound in place with heavy wire or rope.—Ray Champion.

# Handy Helps for the Home

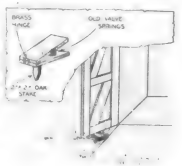
## *Cushion Door Bumper*

TO protect bathroom tiles and walls which might be damaged by contact with door-knobs, the cushion bumper shown at right will be helpful. The drawing gives necessary dimensions. Turn the bumper body on a lathe from 1½-inch diameter round brass stock, and next make the brass plunger in a size permitting it to slip within the reamed hole through the body. The spring, of the type placed under auto valves during grinding, can be bought at a Ford garage for two cents. They can be wound tighter on an arbor and cut to length. A rubber bottle stopper is fitted into the end of the plunger and a retaining pin mounted in the assembly.—Frank L. Wade.

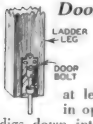



## *Door Stop Is Automatic*

THIS stop holds the garage doors open against wind when backing the car out. The stops are made of ¾-inch white pine, hinged as shown in the drawing, with an old valve spring inserted between the "sandwich." The bottom plate is nailed to an oak stake and the stop driven into the ground so that the door will compress it in swinging open. — Theodore Allen.




## *Door Bolt Secures Ladder*



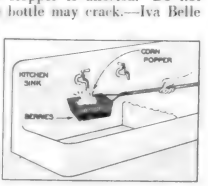

TO prevent ladder legs from slipping, mount ordinary door bolts on the inside of the legs, as shown at left. When the bolt is placed in open position the extended rod digs down into the ground and holds the ladder leg in place. Mount the bolt base in place so that when not in use the bolt can be slid into off position so that its tip is flush with the end of the leg.—R. Wailes.

## *Glass Bottle Stoppers Can Be Loosened by Applying Heat*

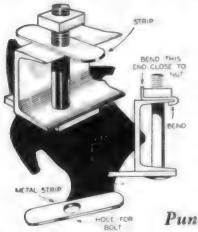
GLASS stoppers for perfume and similar bottles often become tightly locked in place. Such a stopper is easily loosened by holding the neck of the bottle in hot water for about ten seconds. The water should not be scalding, as it will crack the glass, but just about as hot as the hand can endure. In principle the external heat expands the neck of the bottle before the stopper is affected. Do not hold in the water too long, as the bottle may crack.—Iva Belle Allan.

## *Popper Cleans Berries*

RASPBERRIES, blackberries, and small fruits such as cherries can be conveniently cleaned under the faucet of the kitchen sink by placing them in an ordinary wire mesh corn popper and shaking them vigorously while the water runs over the fruit. The shaking motion sifts out dirt and stems. Put in enough fruit to cover the bottom to a depth of about half an inch.—Helen Collins.



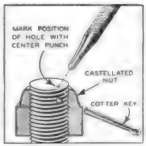
# Kinks for the Workshop




## *Locking Device Prevents Nut Working Loose*

IN CASES where a nut is likely to work loose and a castle nut is not available or circumstances make its use impracticable, a practical locking device can be made in a few moments. From tin, brass, or other available light metal cut a strip the width of the nut and of a length determined by the size of the nut. Cut a hole in the center of the strip to admit the bolt. Insert the strip beneath the nut, draw the nut tight, and bend the ends of the strip as indicated in the drawing at the left. This locks the nut securely.—Joseph McCune.

## *Punch Marks Cotter Key Holes*

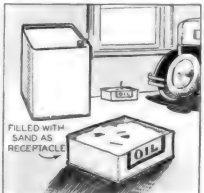



IN MAKING adjustments of castellated nuts on shafts or axles, considerable time is often wasted in locating the cotter key hole after the adjustment is made. This trouble may be eliminated if, before withdrawing the cotter key to make the adjustment, a dot is made with a center punch on the end of the shaft or axle to mark the position of the cotter key hole. The drawing at the right shows plainly how the stunt is done. You will find this little idea very much worthwhile as a time-saver.—George Bailey.

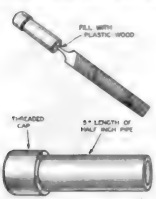
## *Auto Piston Makes Good Cigarette Holder and Ash Tray*

A DISCARDED piston from an automobile engine makes a clever paper weight, ash tray, and cigarette holder. Clean the piston of all dirt and grease and polish it so that it shines brightly. Now cut the piston in half at the point where the piston pin bearings are located, as shown in the drawing at the left. The bearings make a perfect rest for cigars or cigarettes, and the inside of the piston serves as a capacious ash tray.—Alan Lee.

## *Fireproof Shop Refuse Box*




OLD five gallon oil cans can be salvaged for a number of useful purposes. By cutting off the bottom of such can, as shown at the right, and filling it with sand, an excellent fireproof receptacle for matches, cigar and cigarette stubs, and similar fire-producing hazards can be made. For use around garages and shops where gas soaked waste and oily floors are in constant danger of being ignited by a carelessly disposed of match, the advantages are evident.—G. Deckert.



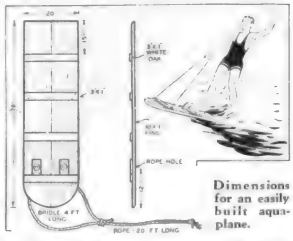

## *Plastic Wood, Pipe, Makes Non-Splitting Handle*

THIS file or tool handle is made out of a five-inch length of half-inch pipe, one end of which is covered with a threaded cap. Fill the pipe with plastic wood and permit it to harden. Then drill a guide hole in the center of the wood with a small drill. The file or tool is then driven into this hole, where it is held securely. The advantage of this handle is that the metal covering makes it impossible to split. In the event the tool loosens in use, it can be tightened.—Claude Cook.

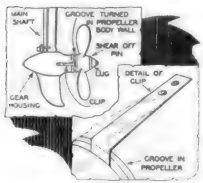
# A Page for the Outdoor Man

## *Build Yourself This Aquaplane*

AQUAPLANING, or surf-boarding, is one of the most exhilarating of sports, and simple as well. It does not require any special skill and is not dangerous unless indulged in at high speeds. Dimensions for a good aquaplane are given in the drawing at right. Two pieces of pine, tied together with oak 1x3's, with special pads under the end of the bridle, will make a good aquaplane that will support a 200-lb. man at a speed of 25 miles an hour. Dimensions can be enlarged for slower speeds.—T. S. Asgaard.




**Dimensions for an easily built aquaplane.**

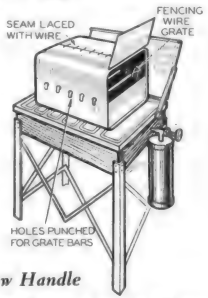


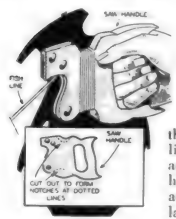

## *Spring Clip Prevents Loss of Outboard Props*

TO PREVENT the loss of outboard motor propellers when they strike submerged obstructions, a spring-clip claw can be fitted as shown at left. Remove the propeller from the motor and cut a groove in a lathe for the end of the clip to ride in. The clip is attached in place with two screws, sockets for which must be drilled and threaded into the gear housing of the motor. The end of the clip, riding in the groove, prevents the propeller from coming off without affecting the function of the shear-off pin.—John Edwin Hogg.

## *Campstove Oven Made From Tin Oil Can*

FOR campers whose cookstove does not have an oven attachment and who tire of a constant fried diet, a five-gallon square oil can makes a neat oven which will satisfy a hankering for baked fish or hot biscuits. Small holes are punched along the seams of the can and the joints laced with wire to prevent the can's opening up if the solder melts. Next, half of one end is cut away with a can opener, and the piece removed is wired to the edge of the can to form an oven door. Holes are punched in each side of the can and heavy wire passed through for a supporting grate. Cover the can bottom with a layer of dry sand, which helps to even out the heat. The oven is now ready for use on the camp stove.—Dick Cole.

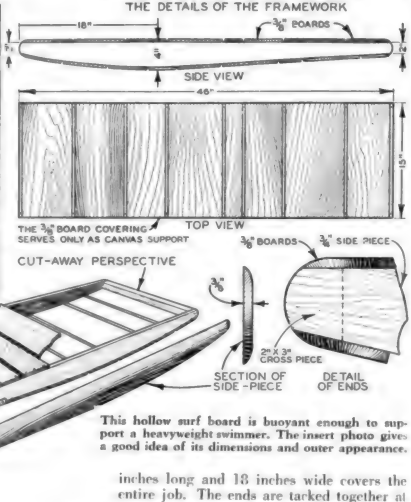



## *Fishline Reel From a Saw Handle*

A REEL for heavy fish lines can be made from an old saw handle which will afford a firm grip when handling large fish. Remove the handle from the saw blade and mark the section you are going to cut away, as indicated by dotted lines in the drawing. Saw these sections out with a key-hole saw and smooth up with a sharp knife and sandpaper. Drill a small hole through the stock to which the end of the line can be tied, and reel it up on the space provided by the hollow cuts. A large quantity of line can be held.—L. B. Robbins.

# This Hollow Surf Board Supports Swimmer in Emergency




**This hollow surf board is buoyant enough to support a heavyweight swimmer. The insert photo gives a good idea of its dimensions and outer appearance.**

A NOVEL surf board, as built by Miner Gentry in a Pasadena school, can be copied from the above diagrams. As pointed out by young Gentry, this board is light enough to be carried easily by a boy and at the same time is buoyant enough to support a full grown swimmer in the water.

Construction is very simple. Most of the neighborhood boys have made these boards from odd lumber found in their backyards, and the only expense was canvas, paint and copper tacks. If you have narrow boards four and a half feet long (or longer if you wish) and about three-fourths-inch wide for the sides, the top and bottom pieces can be taken from packing boxes. The latter do not even need be finished, as they are to be covered with canvas.

In riding a wave, launch the surf board as you would a sled, riding the crest of the wave. A little practice will enable you to launch the board at just the right moment.

A single strip of canvas, about 9 feet 6 inches long and 18 inches wide covers the entire job. The ends are tacked together at the stern, and overlapping edges to the main side members. Use copper tacks. Where the canvas lap goes around the curved ends, slit the material so that it will lie flat against the board.

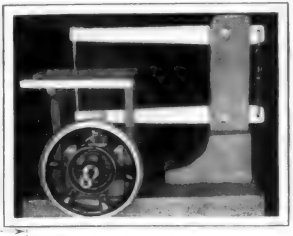
Side pieces about ¼-inch smaller in outline than the main side members, and ⅜-inch thick, are fastened over the edges of the canvas with large-headed copper nails, or flat-head brass screws, well countersunk. Give the sides two coats of white lead and oil, however, before putting on the thin side strips. When dry, paint the entire job your favorite color. A rich orange, ornamented with a cat or dog, fish, star or what have you, in black silhouette, is very effective. When completed the job is smooth all over, free from corners which have proved so uncomfortable in other types of surf boards. This board will be a source of much fun at the lake or seashore, especially when the waves are pounding in, and it can be used with the utmost confidence in its safety.

—Hi Sibley.

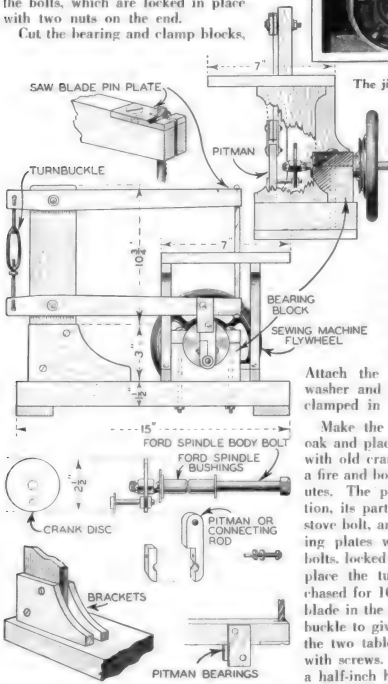
# Jig Saw Is Valuable Addition to Home Shop Equipment

THE sturdy jig saw described herewith can be made by any craftsman by following the complete drawings below. Start with the base and saw out two brackets which are to support the frame on the base. Next cut out the arms and drill the holes for the turnbuckle. The arms are then mounted on the frame with stove bolts, a washer being placed on either end of each bolt. Graphite grease should be rubbed on the bolts, which are locked in place with two nuts on the end.

Cut the bearing and clamp blocks,



The jig saw completed and ready for use.

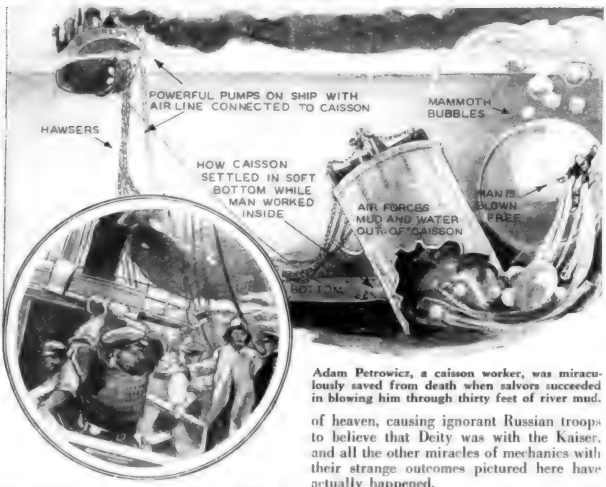



Details of the jig saw construction are completely presented in the drawings above.

with a semi-circular opening in each where the bushings fit. Obtain a Ford Model T steering spindle body bolt, with two nuts and two bushings. Have the bushings reamed out to fit the bolt at any garage. In assembling the crankshaft, slip the sewing machine flywheel on the spindle, then the two bushings, an iron washer, and then screw the castle nut on tightly. Next put the crank disc in place and screw on the other castle nut as tight as you can. Attach the crankpin bolt with nut and washer and the crankshaft is ready to be clamped in place.

Make the pitman or connecting rod of oak and place the two parts in a pan filled with old crankcase oil. Place the pan over a fire and boil the pitman for about 15 minutes. The pitman is then placed in position, its parts tied together with a one-inch stove bolt, and mounted in the pitman bearing plates with 3/16x1¼-inch flat-headed bolts, locked with two nuts on the end. Next place the turnbuckle, which can be purchased for 10 cents, in position. Slip a saw blade in the arm slots and tighten the turnbuckle to give the proper tension. Saw out the two table brackets and fasten in place with screws. The saw blade passes through a half-inch hole in the table top. The saw is now finished and ready to run.—M. Clyde Smock, Jr.

# MIRACLES of MECHANICS




**Adam Petrowicz, a caisson worker, was miraculously saved from death when salvors succeeded in blowing him through thirty feet of river mud.**

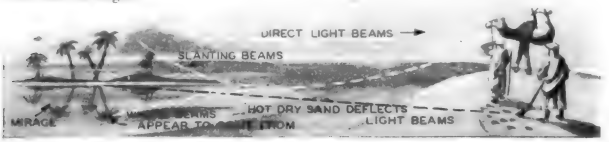


**James Greystoke bought a vessel on which he was voyaging and burned her woodwork and furniture to enable him to win a huge wager.**

STRIKING in their stark truths are these recordings from history in which mechanics have played a heavy part. The famous Angel of Mons illusion, where clever Germans portrayed on clouds over their own lines the angels of heaven, causing ignorant Russian troops to believe that Deity was with the Kaiser, and all the other miracles of mechanics with their strange outcomes pictured here have actually happened.

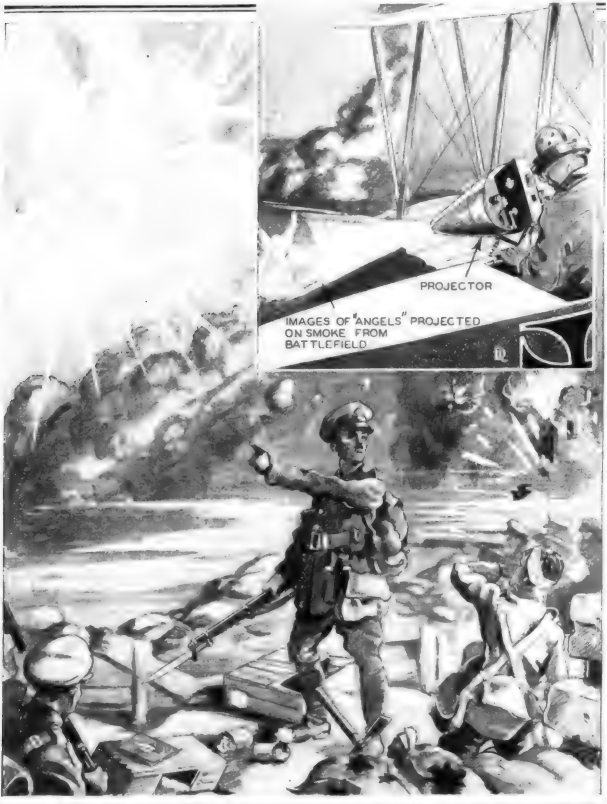
Chronologically, one of the oldest tales which really has truth in it was the tale of one James Greystoke who made a round the world speed tour in the early eighties. The trip was made for a substantial wager, and upon the return trip from America to Lon-

*(Continued on page 192)*

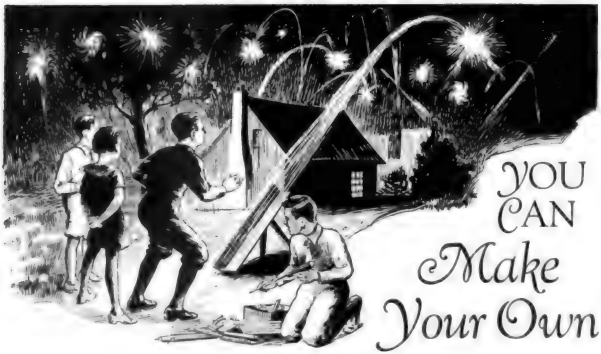



**Hot, dry desert sand often plays tricks with travelers; the most common one being that of the mirage, which makes oases miles away appear within easy reach. Many parties of sportsmen have thus been lost.**

# Freak Happenings of History




**Believed until recently to be what scientists term "mass hypnotism," the famous "Angel of Mons" illusion is shown above as it actually happened. German aircraft, carrying high powered stereoptican projectors, played pictures of angels on clouds, causing ignorant enemy troops to abandon the fight.**



# YOU CAN Make Your Own 4th of July Fireworks

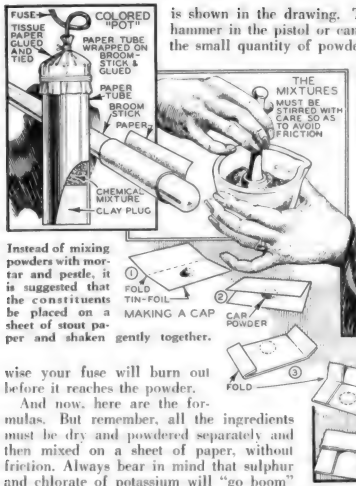
*by* **FREDERICK O. SCHUBERT**

THIS month's chemical section is dedicated to that noble and glorious purpose of celebrating the Fourth of July in noisy fashion—and with cannon crackers and colored fire that can safely be made in your own lab. However, before plunging into a pile of recipes and formulas it is necessary to warn you fellows to be extremely careful in preparing these mixtures. In themselves they will not blow up until brought into actual contact with fire or through extreme friction, but remember always that you are working with explosives—regardless of how mild they may be away from fire.

To overcome the dangers of friction it is well to mix your powders in small doses. A simple way is to put them on a sheet of fairly substantial paper and, by picking up two ends, rolling the powder back and forth as you raise and lower your hands alternately. But where you must use your pestle and mortar—watch out for friction!

One of the first things to prepare are the containers for the powder. These are best made from brown wrapping paper rolled several times around a broom stick. As each turn is made it is advisable to paste it down so that the shell will be fairly solid. Eight or ten turns of paper should be enough for the average fire cracker. The length best suited is anywhere from six to eight inches. They can be made longer, but it is not advisable. After the cylinder is taken from the broom stick, insert an inch of clay in the base. Pack it in solid so that your powder will not filter through. The next step is to take several turns of tissue paper and glue it to the other end as shown in the illustration. A few turns of string will help too. You are then ready to fill in your mixture and place your fuse. Don't pack the powder. Pour it in.

There are several ways of preparing the fuse. The easiest is to take soft cotton string a bit heavier than the kind the grocer uses in doing up bundles and soaking it in a solution of one ounce of saltpetre dissolved in a glass of water. It is ready for use as soon as it has been thoroughly dried. A fuse with a bit of sparkle can be made by using the golden rain formula that follows. The mixture is made into a paste with water containing several drops of glue. The string is thoroughly covered and left to dry. In using this be sure that no space remains along the cord that is not covered. Other-




**Instead of mixing powders with mortar and pestle, it is suggested that the constituents be placed on a sheet of stout paper and shaken gently together.**

is shown in the drawing. They are set off by the force of the hammer in the pistol or cane, and are not dangerous because of the small quantity of powder mixture used. It is suggested that not more than a pinch be used for each cap.

For the fellow who wants to experiment with rockets and Roman candles the following formulas will come in handy. The rocket mixture comprises four parts of nitre, two parts of wood carbon and one part each of sulphur and meal powder. The meal powder acts as a diluent and is a fine brown or black dust. The Roman candle filling is made of eight parts of nitre, four of sulphur and three parts of carbon dust.

In burning colored fire, it is best to place the powder in a pill box and ignite it there. If you experiment with rockets, you will want to construct a platform from which to launch them. A good idea of an efficient launching platform can be obtained from the drawing at the beginning of this article. A simple v-shaped trough of wood or metal, supported at the desired angle by a couple of props or legs, will do the trick. Of course, the angle of the platform will have a very great deal to do with the path taken by the rocket. Usually this angle should be at least 60 degrees to permit the rocket to attain a satisfactory height. A shallower angle than this will produce a flattened trajectory of the rocket which will not be as satisfactory as a sharper, higher path through the sky.

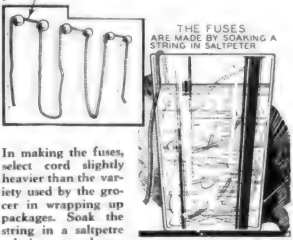
wise your fuse will burn out before it reaches the powder.

And now, here are the formulas. But remember, all the ingredients must be dry and powdered separately and then mixed on a sheet of paper, without friction. Always bear in mind that sulphur and chlorate of potassium will "go boom" when rubbed together. Keep the ingredients away from open flames.

A nice bright red fire can be made by using 20 parts of strontium nitrate finely powdered, six parts of sulphur, 5 parts of saltpetre and one part of lampblack. Your druggist can supply them all in powdered form. They may cost a few cents more that way, but it is safer than trying to powder them yourself.

In making golden rain the main ingredient is saltpetre. Nine parts of it are mixed with three parts of lampblack and four parts of sulphur. Your green fire contains two parts each of barium nitrate and chlorate of potash, to which is added one part of sulphur. White fire is made of 15 parts gun powder, 22 parts sulphur and 64 parts of nitrate of potassium, while blue fire is easiest made by mixing eight parts of chlorate of potassium with five parts of copper sulphate, four parts of calomel and 3 parts of powdered shellac.

One of the safest noise-makers to work with are the caps for pistols and canes. They are made by folding a small portion of a mixture of equal parts of chlorate of potash and sulphur into tin foil. The proper fold




**In making the fuses, select cord slightly heavier than the variety used by the grocer in wrapping up packages. Soak the string in a saltpetre solution, as shown.**

# Postal Flyers Succeed Against

**The first mail carrier—the N-ABNA—one of the Boeing flying boats, carried air mail on the Seattle-Victoria route. This was the first commercial air line. This ship, which is still frequently used, has covered more than a half-million miles. It has worn out eight motors. The map graphically presents the air-mail network today. Many other lines will soon be in operation.**

AT NOON, May 15, 1918, four pilots stood beside their planes ready to take off on the first official attempt to carry mail by air. That day was the beginning of a thing that has spread, not only through the United States, but into all of North America. Since that day millions of dollars have been spent, planes have been wrecked,

# Odds in "Bringing" Mail Through

and pilots killed, but the air mail goes on and it stands today as one of the great affairs of the nation.

The four men who took off on the first flight were United States Army pilots loaned to the Postoffice Department for the trial flight. One plane was in New York, another in Washington, while two pilots waited in Philadelphia to relay the mail in each direction to its destination. The first sack of mail weighed only four and a half pounds but now thousands of pounds are sent through the air over millions of miles from east to west, from north to south, by day and by night.

It was perhaps beyond the hopes of the most optimistic in 1918, when those first pilots took off, that in a short ten years the country would be a network of air routes carrying mail, and passengers, and express, but such is the situation and even now it is only a beginning of what will be developed within the next ten years.

In just three months after the first experiment the air mail was taken over by the Postoffice Department with its own planes and pilots and those borrowed from the army were returned to their own department. Then came the establishment of regular lines which speeded up the mail hours ahead of the land routes.

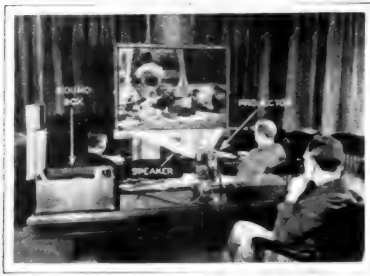
The first year of the air mail resulted in the travel of 16,000 miles and the carrying of 713,240 letters. By 1927, after an increase each year, 2,329,553 miles were traveled and 22,285,000 letters were carried. At first mail was sent by zones similar to parcel post and charges made according to distance, later the charge became ten cents for each half ounce or fraction regardless of distance, and, within the last few months, this rate has been reduced to five cents for the first half ounce and ten cents for each additional half ounce. The cost to the government for carrying by the various flying companies, varies from 83 cents to $3.00 per pound according to the service rendered.

**In flying air mail between San Francisco and Chicago the Boeing system needs planes which meet the greatest climatic difficulties. This ship is the type flown from sea level to 14,000 feet and through temperatures ranging from 30 below on up. It can carry a ton of mail and has a top speed of 142 m.p.h.**

In addition to the criss-crossing of the nation, service began in October with the

*(Continued on page 200)*

# New Portable Projector Brings Talking Movies to Home




Projector and playing unit are mechanically synchronized.

A DISTINCT innovation in the motion picture field, a thoroughly practical portable equipment for the presentation of sound movies, using 16 mm. films exclusively. At first, the principal uses of the Project-O-Phone will center in the business and educational fields. Later, a varied sound-movie library, adapted to the requirements of the machine, will probably be available, so that all can enjoy the talkies in their homes.

The complete Project-O-Phone outfit consists of three small units which can be easily carried from place to place. Any Filmo projector can be adapted for use in this equipment. A standard 16-inch phonograph record of the 33 1/3 revolutions per minute type, is perfectly synchronized with the projected pictures. The projector, player unit and a dynamic speaker each are contained in a separate case, and can be quickly set up and easily operated.

The Filmo projector and playing unit are driven by separate motors, each motor designed for its special purpose. The two units are then coupled together.

## Dump Tractor Speeds Excavation

DIRT handling in excavation and road building work has been speeded up by the introduction of the Dumptor by a Milwaukee manufacturer. This tractor, which is equipped with a front-end dump body, has a capacity of nearly seven cubic yards. Twin four-cylinder engines and caterpillar tread permit it to operate with heavy loads over ground impossible for teams and trucks.

Operates over ground impossible for trucks.

## Hunter's Life Preserver Sweater

THIS woolen sweater is in reality a good life preserver. Knitted into the sweater are pockets completely around the body. Each pocket contains a thin rubber tube which may be inflated, the complete set having enough buoyancy to keep afloat a man of the size for which the garment was designed. When the tubes are deflated the garment resembles in every respect a high grade woolen sweater.

# Scientific Explanation of the Mexican Jumping Bean

THE Mexican jumping bean, that playful little legume which many suppose to be nature's attempt to furnish a concentrated meat and vegetable ration, needs no longer puzzle the uninitiated, for science has laid bare the secrets of its life.

It seems that a fly lays its egg in the pod of a Mexican bean. In due time the egg hatches and the larva develops into a good sized worm; then, instead of being able to escape from its tough pod it finds itself trapped. A small, active animal develops and finds itself encased inside the bean. It lives on the pulp, and becomes more and more active, especially under the warm rays of the sun or artificial heat.

When a bean is warmed up the worm within it curls up and then snaps out straight, causing the bean to tumble, roll over and move about as if by serious intention. Meanwhile, nothing but the husk of the legume is visible. Hence, the name "Mexican Jumping Bean."

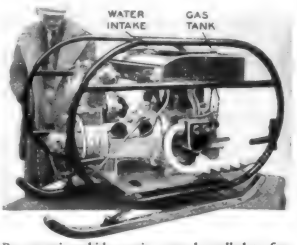
Armida scolds her pet bean for revealing its inside life.

## Compact Ratchet Screw Driver Set

THIS small but sturdy ratchet screw driver set is designed especially for use in places difficult to reach. The set is sold in a handy box containing three assorted blades and a special wrench for locking them on the handle. The ratchet device, which works in both directions, is contained in the handle, and permits unusual power being applied even in the most difficult corner.

## And Now a Portable Fire Engine

THE latest thing in fire-fighting equipment is a portable motor and pump which may be moved to the scene of the fire, no matter how inaccessible. The equipment is mounted on elastic runners so that




By removing skids, engine may be rolled to fire.

it can be handled easily and transported on an ordinary truck. The device should prove popular with village fire departments.

# Interesting Experiments

**A sheet of paper hung loosely between the leaves of a book is forced upward from its original position, indicated by the dotted line, by the partial vacuum created on the surface of the sheet when the experimenter blows in direction of arrow.**

**You've seen flags flutter in the breeze, watched airplanes fly, read of buildings which collapsed from the inside out in tornadoes—but do you understand the cause of these phenomena? Mr. Jenkins, famous for his inventions in the field of television and inventor of the movie projector, has devised a number of fascinating experiments to test the behavior of air currents. Try them for yourself, as explained below, and you'll have a better knowledge of why airplanes fly and why gliders glide.**

WHY does Old Glory flutter in the breeze? Why doesn't it stand out straight from its staff like a piece of tin? A flag does not flutter in water. So where does the flutter come from?

If you can find the answer to that you are on the trail of why airplanes fly, why birds and gliders glide, why buildings collapse in tornadoes, why strong wind breaks plate glass windows outward instead of blowing them in, why the ball dances on top of the water stream in the fountain, why baseball pitchers throw curve balls, why streams in flood crest in the center, why logs are sucked out to ride the crest, why the lamp flame is drawn toward the open window—in fact you are on the trail of the unusual of usual happenings.

Emerson said "That is ever the difference between the wise and the unwise: the latter wonders at what is unusual: the wise man wonders at the usual."

Yet if you start hunting through books for an explanation of why the flag flutters the only one you will find, that I can recall, is one I discovered many years ago in "Alice in Wonderland," where she tells us that the Old-Man-in-the-Mountain supplied flutters for flags, rustles for silk dresses, and a very superior quality of post hole.

Obviously that isn't a very satisfactory explanation, so I have drafted a simple explanation into a physical law which I could apply. In simple words that law is: "Any object free to move in a fluid will move toward that part of the fluid having the swiftest motion."

That is why the flag flutters, why leaves are "sucked" up from the ground, and that is why buildings are often pulled apart in windstorms.

If you add to that a second law—that air moving at increased velocity is accompanied by decreased pressure — you have the basis for a study of model airplane and glider design, or for the building of big powered planes.

That is the law that explains the increased lift on top of an airplane wing—where a partial vacuum exists—and why that lift increases as the depth of chord, or thickness of the wing, is increased. Put in simple language, when the wing meets the air the current is divided, and some passes under the wing and some over the top. Unless the two streams reach the rear edge at the same time there will be a vacuum behind the wind. But, as the air traveling over the curved top surface has farther to go than

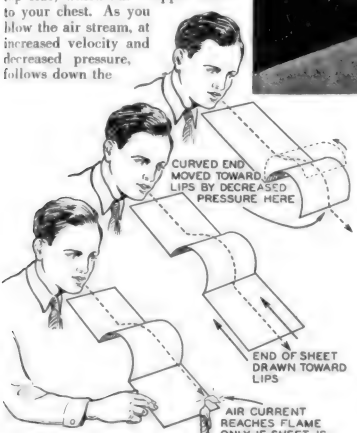
# with Air Currents

by C. FRANCIS JENKINS
*Famous Inventor*

the air under the wing, which has a flat bottom surface, the only way it can get to rear on time is to speed up.

If you want a very simple demonstration of the lift of air at high velocity passing over the top curved surface of an airplane wing, hold a sheet of letter paper by two corners before your lips and blow over the top side, which has dropped down to your chest. As you blow the air stream, at increased velocity and decreased pressure, follows down the curved surface of the paper, creates a partial vacuum, and the normal air pressure beneath the paper lifts the sheet upward.

**Another interesting stunt with folded paper. High velocity air stream reduces pressure in center of paper, and outer air pressure forces the sides inward.**




**Drawings showing behavior of air currents as described in this article. An air stream moving in the direction of the dotted arrows moves curved end of paper toward experimenter, in upper drawing; moves end of sheet toward him, in center sketch; and in the bottom drawing blows out the candle if the end is held down. If the end is released, candle flame is not touched, but paper moves toward experimenter. Prove these for yourself.**

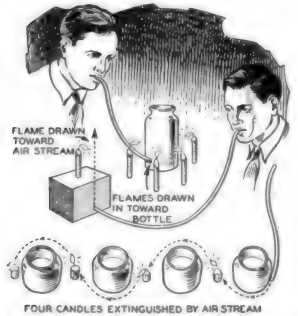
You can get an even more pronounced curve in the paper by clamping the end between two books or magazines, and, by blowing hard enough, lift the free end from a vertical to a horizontal position.

There are innumerable little tricks with paper that teach the basic facts about moving air currents, their effect on free moving objects, and all have some bearing on flying, and, in particular, gliding and soaring flight.

Take a sheet of letter paper, put a crease across it about four inches from one end, pull the shorter portion over the edge of a desk or table to give it a curve, as shown in the drawings. Lay the sheet on the table, with curved portion away from you, place the fingers on the nearer end, the lips close to the surface, and blow. The air stream, deflected upward and around the curved portion, decreases the pressure there and the air underneath the curve, pressing upward in an effort to get into this swift moving stream, raises the curved paper upward and bends it toward you.

Now take another sheet and crease it down the sides, leaving a space of about

## *Flame Shows Path of Air Stream*




**Blowing against the side of a curved object causes part of the air stream to follow around the object, as proved with candle flames. Blowing against a flat object such as a box deflects the air stream upward.**

2½ inches between the creases, and draw both sides over the table edge to curve them, as shown in the accompanying photograph. Lay this on the table, blow down the center, and the two sides are forced in toward the central air stream.

Next put the curve in the center of a sheet, as shown. When you hold the nearer end and blow, the air stream, following around the curved surface, to which, because of its decreased pressure, it is held by the outer air pressure, creates a partial vacuum, and the air underneath the curve, trying to get into this fast moving stream, raises the curve and pulls the farther end toward you. But if you put a finger on the opposite end to keep it from moving nothing will happen. Light a short piece of candle and place it beyond this far end, hold the paper down with your finger, and when you blow over the paper you can blow out the candle. But release the farther end, light the candle again, and when you blow, the air stream, instead of reaching the candle, will curve around the paper and come back with it toward you. And the candle flame, you will see, will be drawn toward you, for the air around it is also being drawn into the moving stream.

Nothing illustrates that habit of moving fluids sticking to curved surfaces so well as a little demonstration with a candle, a small rubber, paper or metal tube, and some round object, such as a water glass. Light the candle and place it close to the glass. Hold the end of the tube against the opposite side of the glass and blow. The air stream follows the glass, because at its increased velocity its pressure is less than that of the outer air. And, following around the glass, it blows out the candle on the opposite side. You can get the same effect with a much larger circular object, such as a water pail, or one of those fiber wastebaskets.

Place some half dozen lighted candles in a semi-circle around a water tumbler, with the candles about two or three inches away from the glass. Now, with your tube, blow around the surface of the glass, and watch all the candle flames being "sucked" toward the air stream.

Or put your candle on top of a small box or a pile of books, and blow at the base of the support. The air stream is deflected up the vertical side, the surrounding air is drawn into it, and with the air the candle flame is drawn toward the moving stream.

Another stunt with water glasses and candles is to place three or four glasses in a row, with candles between them and beyond the last glass. If your spacing is proper, the air stream blown on the first glass will go half way around it, put out the candle, pass in the opposite direction half way around the second, put out the candle, and continue on until all four lights are extinguished. In each case at least part of the air stream has reversed its direction of curve in order to continue around the next glass.

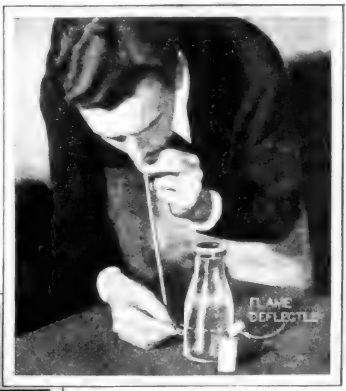
Have you ever watched a bird hover on motionless wings, and suddenly, without a single flap, shoot upward in the air? Or read about a motorless glider in Germany climbing more than a mile high on rising air currents, remaining in the air more than fourteen hours, or traveling more than fifty miles across country?

Gliders do marvelous things, but they don't begin to compare to even the average good gliding birds, such as the gull, the hawk, or the eagle.

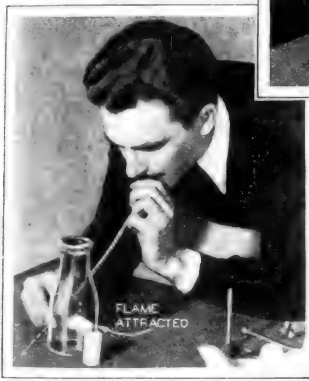
These simple experiments with paper and candles were designed to show why airplane, glider and bird wings have a lifting effect in moving air. Here are some of

a different type that carry the lesson a bit further.

If you can get one of those light celluloid ping-pong balls, an inch and a half in diameter, you can make it float in the air. All you need is a tube—rubber, metal, or rolled up paper. Hold the ball loosely above the end of the tube and start blowing. As long as your breath holds out the ball will ride on top of the current. Its distance above the tube end will be the point at which the force of gravity trying to pull it down exactly balances the lifting effect on the ball. Now place the ball against the wall and blow against it.




**A strong air stream directed against the side of the milk bottle will follow the bottle's edge, instead of going straight ahead. This is proved with the flame of a candle.**




**If the air stream is comparatively weak, it does not follow the *side* of the bottle, but takes a straight-ahead course which attracts the flame of the candle.**

You can hold the ball against the wall with nothing but an air stream to support it, and if you move the end of the tube the ball will follow around over the wall, always remaining in the center of the air stream.

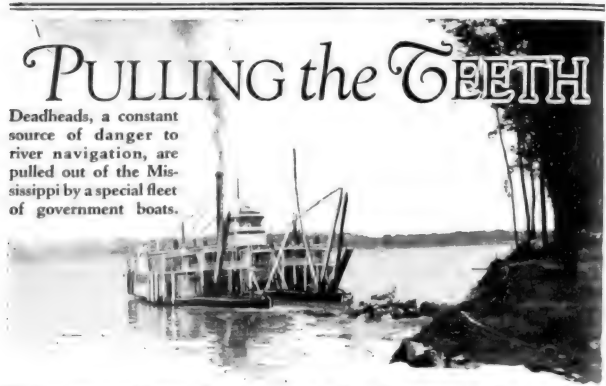
In the first experiment you might suppose that the pressure of the air stream was supporting the ball, and in the second that the pressure was keeping the ball against the wall. But that doesn't explain why it should move around to follow the movement of the tube. So the only possible explanation is that the high velocity air stream curving around the surface of the ball has decreased the pressure there, and the outer air, at higher pressure, is being drawn in from all sides.

If you have a vacuum cleaner in your home here is one stunt of my own invention that's still more remarkable. Remove the dust bag from the vacuum cleaner and place a cardboard mailing tube over the blower outlet. Set the machine so that the tube points upward at a 45-degree angle. With the power of the electric blower you can use a much heavier ball, such as tennis balls.

Start the motor and release the ball in the air stream. It will rise along the stream, just as a bird or a glider rises, until it reaches the point where the force of gravity neutralizes the lifting effect. But, when it reaches that point, instead of falling to the floor it will remain suspended in the air.

# PULLING the TEETH

**Deadheads, a constant source of danger to river navigation, are pulled out of the Mississippi by a special fleet of government boats.**



**The Government yearly destroys 10 to 20 drift heaps and 10,000 trees along the Mississippi's banks.**

PLAYING dental surgeon to the Mississippi is one endless duty of Uncle Sam of which we hear little. The teeth are snags —trees, debris, derelicts and wreckage which lodge in the channel and hinder navigation.

Army engineers have the task of yanking such obstructions. And as long as the Mississippi continues to flow the Government will have to continue its snag boat service.

The average snag weighs about 40 tons while the Goliaths range to 175 tons. A snag boat removes 100 to 300 during the season. There is no reliable method of forecasting the number.

The boats were originated expressly for this purpose. Each boat is 190 feet long, 95 feet in beam and carries 45 officers and men. They are of double-bowed catamaran design with steel butting beams 15 feet long and 10 feet wide fastened securely between the bows. Each boat is equipped with a huge sweep chain operated by a quartet of engine-driven capstans, exerting a total pull of 140 tons.

In certain cases, this system is futile. Thereupon, the captain brings his "heavy artillery" into play. The boat backs away some 60 or 70 feet from the submerged snag. He orders "full steam ahead." The 800-ton vessel rams the snag with her steel butting beam and repeats the butting until the snag is loosened. The impact is frequently so great that all aboard are thrown on the decks while the fire doors are tossed wide open.

Gasoline powered saws reduce the snag into 20-foot logs after it is raised. These salvaged logs are cast overboard immediately after cutting as the government boats are not qualified to haul them to commercial mills and have them reduced into marketable lumber. Log hunters in launches trail the boats and salvage a living from the flotsam. Occasionally, these chasers fish $175 worth of logs in one day.

Generally snags point down-stream, turned by the pressure of the current. Trees usually right themselves and bury their roots and butts in the sand and mud. A V-shaped break in the surface generally is the signpost of a submerged snag. It causes a so-called "boil" which sharp-sighted lookouts on the snag boats are quick to recognize. The boat is maneuvered as close to the submerged obstacle as possible. The sweep chain is lowered like a fishline and attempt is made to snare the snag.

The snag boats also salvage or destroy wrecks in the open channel. Divers recover valuable machinery and equipment from the wrecks which sink to extreme depths. The drag chain is used to smash the buried hull.

# of the MISSISSIPPI

The drag chain is used to hoist snags from the river. A sansome chain operated by a windlass hauls them aboard ship to be cut up. The chain can handle 75 tons. Each link is of iron, 2½ inches in diameter and weighs 27½ lbs.

The Federal snag boat, Horatio G. Wright.

If the wrecked vessels are in good condition, the snag boats raise and float them to the nearest dry dock. The owners are required to reimburse the government for such aid. During periods when the boats would be idle otherwise, they assist private owners on a cost basis in recovering wrecked boats.

The thrills of hazard and adventure are linked intimately to snag fighting. Note the man held by the legs as he fastens the chain under water.

# A "Pygmy" Short-Wave TRANSMITTER

By L. B. Robbins

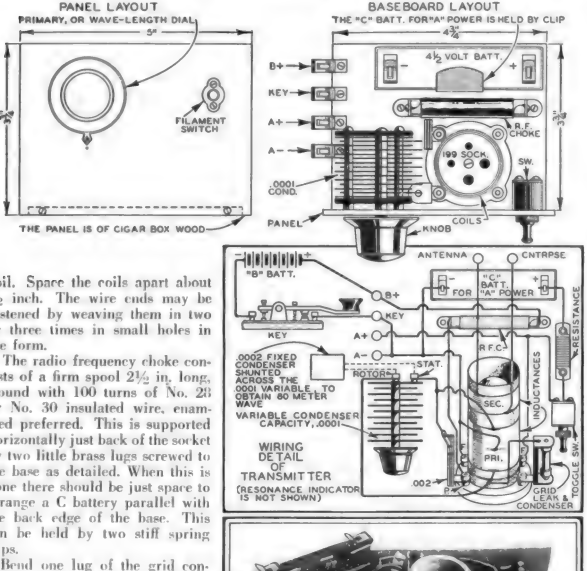
**With a portable short-wave transmitting set built after the plans presented here, Mr. Robbins has broadcast signals more than 100 miles. The entire set is not much larger than a box camera, and junked pieces of equipment can be used in its construction.**

ANY radio experimenter who has a leaning towards short wave work will undoubtedly be interested in this little transmitter because of its ability to cover good distances with the small amount of power called for. It also has the advantage of very low cost of construction and operation and the writer believes forms a real step in the direction of actual low-power transmitters. It is all self-contained except the B power. This can be the 110 AC power in your home or can be supplied from three 45-volt B batteries or a 135-volt B eliminator. The transmitter is so small that it can be packed and carried in any ordinary traveling bag with the necessary key, antenna tuning unit, B batteries and antenna. The conventional Hartley circuit is used and it will operate well on either the 40 or the 80 meter bands. It will operate a phone on 80 meters for two or three miles.

The base is of thin wood 4¾ in. x 3¾ in. The panel is of cigar box wood 5 in. long x 3¾ in. high, and is fastened to the base in the conventional manner, as shown. The panel contains the primary tuning condenser of .0001 capacity of the type used for trimming condensers in some of the larger broadcast receivers. The one shown served as an antenna condenser in an old style Browning-Drake. This is mounted at the upper left corner of the panel, while a toggle switch is placed at the right.

A small UX or UV socket is then fastened to the base close to the panel and far enough from the tuning condenser to support the coil which fits over the tube. The latter is a UX 199 or UV 199, as the builder chooses. Arrange the socket so the grid post is at the right front. The coil consists of a 3 in. length of light mailing tube that will just fit snugly over the socket, about 1¼ in. in diameter. Wind on 17 turns of No. 22 DCC wire slightly spaced for the primary or tuning coil. Then above it wind on 7 turns of the same wire for the antenna or secondary

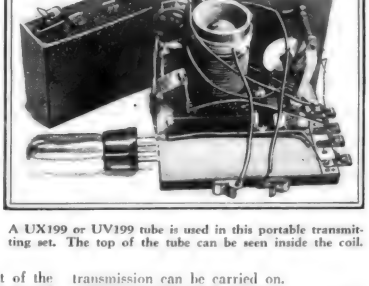
## *Drawing Shows Details of Construction for Panel and Baseboard of Set*




coil. Space the coils apart about ½ inch. The wire ends may be fastened by weaving them in two or three times in small holes in the form.

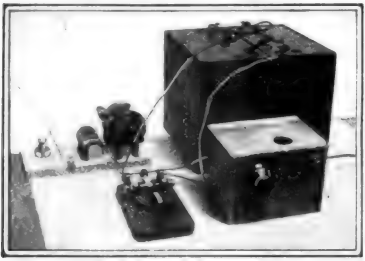
The radio frequency choke consists of a firm spool 2½ in. long, wound with 100 turns of No. 26 or No. 30 insulated wire, enameled preferred. This is supported horizontally just back of the socket by two little brass lugs screwed to the base as detailed. When this is done there should be just space to arrange a C battery parallel with the back edge of the base. This can be held by two stiff spring clips.

Bend one lug of the grid condenser so it can be screwed directly to the grid terminal of socket and stand vertically. The plate blocking condenser can also be fastened vertically to the base alongside the plate terminal. The detail sketch shows this arrangement fully. A third fixed condenser of about .00015 or .0002 can then be fastened to the base flatwise under the tuning condenser and one terminal connected to the rotor of the condenser. Solder a thin metal strip to the other fixed condenser terminal and drill a hole in the end so it can be slipped over the stator post of the tuning condenser. With the strip connected the transmitter will operate at 80 meters; when the strip is disconnected 40 meter transmission can be carried on.



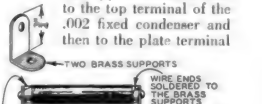
A UX199 or UV199 tube is used in this portable transmitting set. The top of the tube can be seen inside the coil.

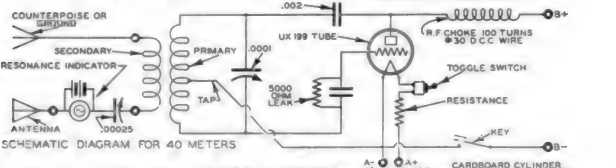
There should be just enough room back of the R. F. choke to place a 4½-volt C battery which can be held in position by



Set up ready for operation.

Resistance can be taken from an old rheostat, tested with a voltmeter and inserted between the battery plus terminal and the switch as shown. Then wire the B plus post direct to one end of the radio frequency coil, connecting the opposite end of coil to the top terminal of the .002 fixed condenser and then to the plate terminal



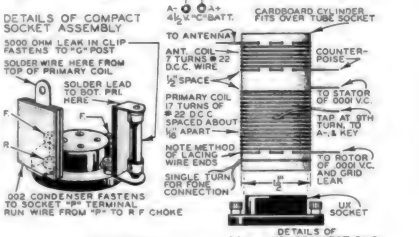

SCHEMATIC DIAGRAM FOR 40 METERS

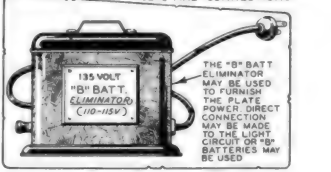
two pieces of spring brass.

At the left edge of the base arrange four Fahnestock clips, marking them B plus, Key, A plus and A minus as shown. On the rear edge place two more clips for antenna and ground (or counterpoise).

Use No. 22 or No. 24 wire in wiring the transmitter and cover all pieces with spaghetti. Solder where necessary and make all other connections tight. The wiring diagram is self explanatory, but to insure a correct circuit proceed as follows:

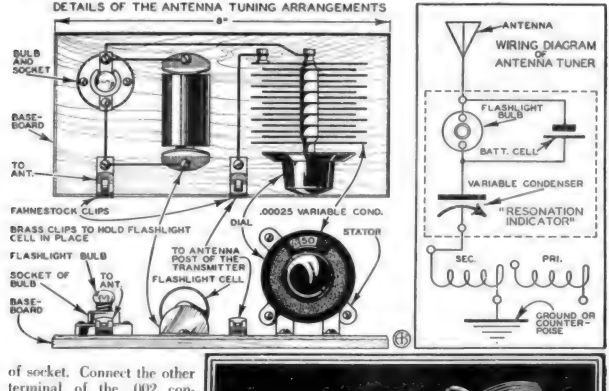
Wire the A minus post to the Key post—to the 4½-volt tap on C battery—to one filament post on socket—and to the exact center turn of the primary or 17 turn coil. This latter can be done by lifting the turn with a pen-knife, scraping the insulation off and soldering the A minus lead directly to it. Connect A plus post to one side of the toggle switch—and to remaining filament terminal on socket. Connect other side of toggle to a sufficient resistance to reduce the battery voltage to not over 3.5 volts.

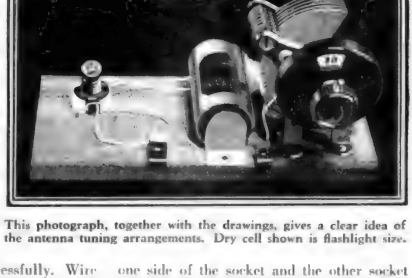



**The unit is all self-contained except the B power, supplied from batteries or B battery eliminator.**

## *Variable Condenser, Flashlight Cell and Bulb Used in Antenna Tuner*



**This photograph, together with the drawings, gives a clear idea of the antenna tuning arrangements. Dry cell shown is flashlight size.**

of socket. Connect the other terminal of the .002 condenser to the stator post of the variable tuning condenser. Then connect the rotor of the latter to the bottom of primary coil and to the top end of the grid condenser. The stator should also be connected to the top of the primary coil as shown. The additional fixed condenser for raising the wave length has already been mentioned. The grid leak should be of about 5000 ohms, although an old fixed resistor such as an Amperite has been used successfully. Wire the ends of the secondary or antenna coil over the battery and down to the two clips at the rear of base. The bottom of the secondary should be led to the counterpoise clip and the top of coil to the antenna clip.

The antenna tuning device consists of a .00025 variable condenser mounted at one end of a piece of thin board 8 in. long by 3 or 4 in. wide. At the opposite end place a flashlight bulb socket and two spring brass clips to grip the ends of a flashlight cell. A pair of Fahnestock clips face the front edge of board. Connect the condenser rotor to clip No. 1. Connect the stator to one side of the socket and the other socket terminal to clip No. 2. Then connect the socket also to the two battery clips. This shuts the cells across the lamp.

Connect the antenna post on transmitter to clip No. 1 and the antenna itself to clip No. 2. Then connect the counterpoise or ground direct to that post on the transmitter. Provide a dial, of course, for operating the antenna tuning condenser.

The B or plate power can be of any suitable kind, either B batteries, B eliminator or by attaching the AC lines direct to the B post and key. In any case do not

*(Continued on page 202)*

Edited by L. B. ROBBINS

**Valuable tips for the radio set owner and experimenter are presented here every month by the department editor. Mr. Robbins is well known as a contributor to various technical magazines, especially in the field of radio. He is owner and operator of amateur radio station W1AFQ. He will gladly answer your questions about radio.**

## You Can Log Every Radio Station in North America

DID you know that you can log every radio station in the United States, Canada, Mexico, Cuba, Porto Rico, Hawaii and Alaska, without ever having heard more than ten or twelve in your immediate neighborhood?

That's not news to a lot of the older fans, but many of the owners of the new one-dial, all-electric receivers have never heard of it.

The process is simple, and all you need is a sheet of graph paper, laid out with ten lines to the square, and at least 100 lines one way and 95 the other. Mark the left hand vertical line zero, and then number across the bottom 5, 10, 15, 20 and so on to 100. That represents the one hundred points on your tuning dial.

Next mark the bottom horizontal line 1500, and number up from it, 1450, 1400, 1350 and so on to 550. That represents the radio broadcast band, with frequencies ranging from 500 to 1500 kilocycles. As the station wave lengths are spaced ten kilocycles apart each horizontal line on your graph sheet represents one group of stations, and each vertical line one point on the dial.

Now take the dial readings for ten or twelve stations, scattered over the dial, look up the kilocycles of each station in the log book, and mark the corresponding point on the paper. For example, if a station on a 1300 kilocycle frequency comes in at 15 on the dial you mark the junction of the 1300 horizontal line with the vertical one numbered 15. After you get all the stations you have heard and identified marked on your sheet connect the points with a curve. The line will start upward from the lower left corner and curve toward the right, terminating in the upper right corner.

All of the stations broadcasting on 550 kilocycles will come in at the point on the dial indicated by the junction of the 550 line and the curve. Each horizontal line, where it crosses the curve, marks another broadcast band, so you have only to take those readings and jot them down after the kilocycle listings in your log book to have every station in North America logged.

Using a Radiola 18, the writer recently brought in in one night more than forty stations that had never been heard before, including stations from 1,000 to 2,000 miles away, such as Havana, Mexico City, Montreal, Toronto, and Los Angeles, San Francisco and Portland, Ore. There is no reason why you can't do just as well with your set. The entire task can be completed in a few minutes, and you will know just where to turn the dial to tune in new stations.

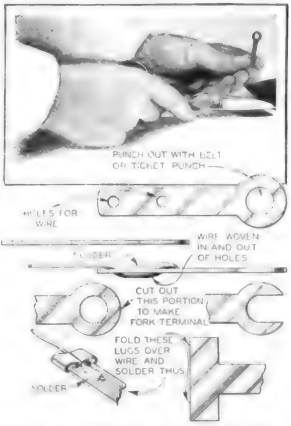
# Make Your Own Wiring Terminals Out of Sheet Metal

METAL terminals are not necessary, but are mighty convenient in hooking up batteries and making temporary connections in a set of radio apparatus. If you have none you can quickly make them as shown out of thin sheet brass, copper or tin.

Cut out strips of stock ¼ inch wide and then cut into 1-inch lengths. These are then cut with shears into the shape shown, making the neck about ⅛ inch wide. Drill two small holes in the end of the neck and then punch a hole with a belt punch or ticket punch in the center of the circular portion. Weave the wire into the holes in the neck and solder in place.

Another method also is shown in which the neck is cut in the form of a T. The ends are then bent over the wire with pliers and soldered.

To make a fork terminal simply cut out the side of the circular part with shears so the tines point away from the neck.



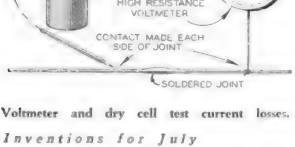

Showing how terminals are cut out with shears.

## Testing Soldered Joint Losses

THE radio builder and experimenter will be surprised to learn the extent of signal losses that exist in corroded and worn joints in antenna and wiring of the set. About once a year every joint should be tested for such losses and any bad joints corrected. A good way to test soldered joints is as follows:

Get a very high resistance voltmeter, such as one with 1000 ohms resistance per volt. A 0 to 5 or 7 reading is ideal. A flexible wire and a single dry cell are the other requisites.

Connect them up as shown in the diagram with the meter and battery in series and a wire extending from one side of the meter and from one side of the battery. First short the circuit and take an exact reading of the dry cell voltage. Then shunt the two contacts around the joint to be tested. That is, place one wire on each side of the joint as shown. If the joint is in perfect condition the meter reading will be the same as when first taken. If it drops any noticeable amount, say from 5 to 10 per cent, it indicates resistance and should be resoldered at once. In fact if there is any drop in voltage reading resistance is indicated and should be remedied, no matter how little. A perfect joint will show absolutely no resistance or voltage drop.




Voltmeter and dry cell test current losses.

## Dust and Dirt Cause Noises

MANY sets produce a sound like the rumble of thunder when the volume control is adjusted. The service man, called upon to repair the set, simply cleans the contact and the wire turns. Dust and dirt may be the cause of noise in wire-wound devices, although poor design may cause uncertain contact and therefore noise. The better types of volume control are now enclosed, so that no dust or dirt can reach the working parts.

# Check Condition of Lightning Arrester on Your Radio

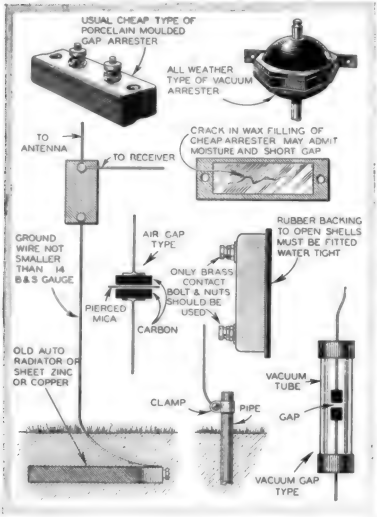



**Diagram shows how to test various types of lightning arresters.**

WHILE a lightning arrester has no protective effect when the house or antenna is hit by a direct lightning stroke, it does offer some protection from nearby discharges and heavy static that might otherwise ruin the radio receiver. It therefore behooves one to see that the arrester is in good shape during the summer months or to install one if not so equipped. Moreover, fire insurance companies demand it.

The arrester is always installed between the set and the antenna and grounded. The gap provided comes between the antenna and the ground and heavy surges jump this gap and are carried off out of harm's way. The gap in all arresters consists of two points or electrodes supported a slight distance from each other. This distance is such that 500 volts or more will jump the gap from antenna to ground instead of going through the set. Such gaps are located in a vacuum, in a gas-filled tube, or in air inside a water tight compartment. It is this gap that makes an occasional check-up necessary.

The vacuum type of arrester is usually built so well that no more than a glance at the outside connections is necessary. *All* binding posts for antenna and ground should be of brass or bronze or other rust-resisting metal. If of iron, they will surely rust and form a high resistance to any surges that may take place in the arrester, thus destroying its efficiency.

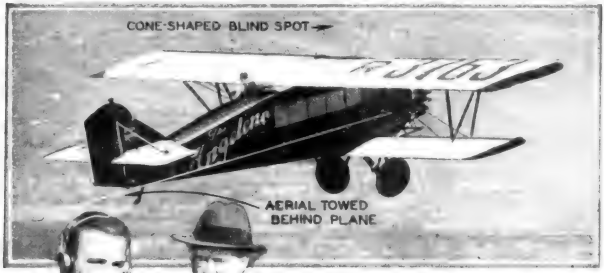
Look at any cheap air gap arrester and inspect the condition of the back. This is usually a filling of sealing wax or similar compound. If it has cracked from climatic changes there is a good chance of moisture penetrating and lodging in the gap, thus shorting signals to the ground. If your receiver loses signal strength after a heavy rain or the signals seem to cut in and out, suspect the arrester at once. If found faulty, dry it out thoroughly and then reseal with fresh wax, or better yet, buy a new arrester.

Some arresters consist of a porcelain shell with the air gap suspended free inside. The back is closed by a rubber pad. It is a mighty good one that won't at some time or other take in moisture and short the points. The rubber should be thoroughly shellacked to the back of shell before installing and then the whole arrester shielded with a hood overhead to keep off rain drippings.

Disconnect the wires every few months and brighten both them and the terminals. You may then see improvement in reception. All extra resistances should be kept out of the antenna system.

Connect the ground wire to a good ground. This means direct to a pipe driven deep in moist soil, or better yet, an old auto radiator buried in a deep hole. Large copper or zinc plates well buried are also excellent.

# Trailing Antenna Solves Radio Problem for Airplanes




Dotted lines in the above photo indicate the boundary of the cone-shaped electrical "blind" spot behind the bulkhead separating motor from pilot. In this cone a radio aerial can be towed without interference from the engine's ignition.

Royal Steadman, radio operator, and C. Francis Jenkins (wearing the hat), with the light weight airplane transmitting and receiving apparatus developed by Mr. Jenkins for use in airplanes.

RADIO transmission and reception from airplanes without any shielding or bonding of the airplane parts has been successfully achieved by C. Francis Jenkins, famous radio and movie inventor. Mr. Jenkins demonstrated his discovery to army and navy officials in Washington recently, and it was used for the first time in actual service on the radio plane which accompanied the First Pursuit Group in its flight from Selfridge Field to the west coast last winter.

The idea is simple. It consists of trailing an antenna behind the plane, instead of dangling it below, or raising it above the fuselage on a short mast.

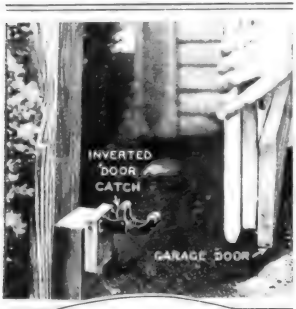
Interference of the ignition system of the engine has been the chief problem in radio transmission from airplanes. Elaborate bonding of all metal parts and shielding of the engine has been the only remedy.

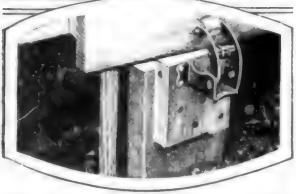
Jenkins, who is a pilot, and, at the age of 62, flies his own cabin ship regularly, conceived the idea that the fireproof bulkhead required by law between the pilot and the engine of every plane should act as a shield, and that behind it was a cone-shaped electrical "dark spot" in which, theoretically, there should be no interference.

To test the theory he had his laboratory build a combined receiver and transmitter, which, with all batteries, is only 14 to 16 inches and five inches deep, and weighs but 26 pounds. A handkerchief was tied to the end of the aerial wire, and, when the plane took off, the cloth was tossed out of the window. It shipped aft in the slip stream and dragged the wire out behind the plane. The operator called the Jenkins broadcasting station outside of Washington and two-way conversation was carried on without any interference.

A further experiment in a navy tri-motored ship showed that the metal wind stream fairing of the wing motor nacelles acted as an efficient shield, so wing motors also caused no interference. Small wind cones, a foot in length, were substituted for the handkerchief.

# New Handy Kinks



**Ordinary door catches—available in any hardware or furnishings store—are used in this catch for garage doors. The same idea can be used for all manner of doors that must be held shut.**

## Catches Hold Garage Doors Open

SCREEN door catches, costing ten cents each, are ideal for holding swinging garage doors open. The doors are opened to the desired position, and wood stakes not smaller than 2x4 inches in cross section are driven into the ground, near the edge of the door and next to the outside surface. These stakes serve as door stops and as supports for the catches, which are mounted on blocks to bring them level with the inside of the door. Operation of the catches is automatic.

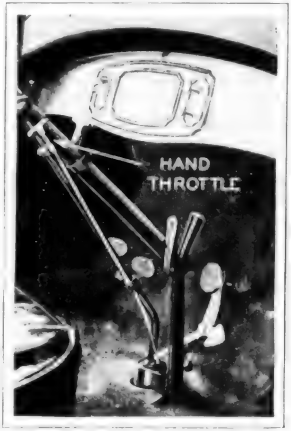
The catches can be inverted so that they will hold the sides of the door rather than the bottom. In that respect it follows the installation and operation of the catches for screen doors. The flexible action of the springs can be maintained by frequent oiling to prevent rust.

## Handy Throttle for Quick Action

STALLING on hills and in traffic may be eliminated by use of the new safety throttle which permits the shifting of gears while the feet are kept on the brake and clutch. The same effect is obtained as if the foot throttle were being used.

The illustration shows how the safety throttle is placed on the gear-shift lever, where it may be manipulated while shifting gears, thus leaving the right foot free for the brake. The device is easy to install and requires no change being made on the car.

A handy, easily grasped pull lever is situated convenient to the gear shift. By drawing up the connection the same time the gear shift is moved, shifting is simplified and gas fed to the motor.




**The safety hand throttle permits use of both feet.**

# for the Summer Motorist

Articles can be quickly and easily removed by lifting nearest hook. They are always in sight.

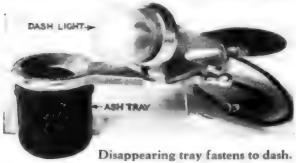
THE new carry-all car-net applies the principle of utilization of waste space to the automobile in a neat, and practical manner. It is a knitted net that suspends from the ceiling. It is attached to the bows supporting the top with metal hooks that are quickly screwed in. As all cars have these bows, and as this net is adjustable to size, it fits every make of automobile.

The attachment can be made in five minutes without marring or marking the interior. The net and hooks may be removed without leaving marks.

## Ash Tray Disappears Under Dash

A DISAPPEARING ash receiver which, when not in use, is out of the way under the dash, is an accessory now offered motorists. One of the features embodies an air-tight baffle plate for automatically snuffing a cigarette, and preventing any ashes or odor escaping from the bowl.

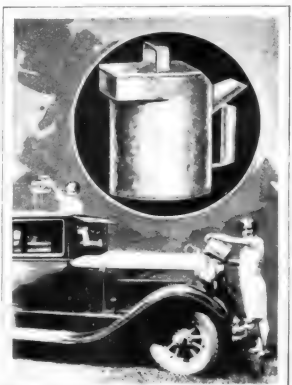
The receiver is fastened to the dashboard by means of a setscrew. A short length of wire connects the light to the ammeter. The entire attachment is silver-finished and highly polished.




Disappearing tray fastens to dash.

## Convenient All-Around Water Can

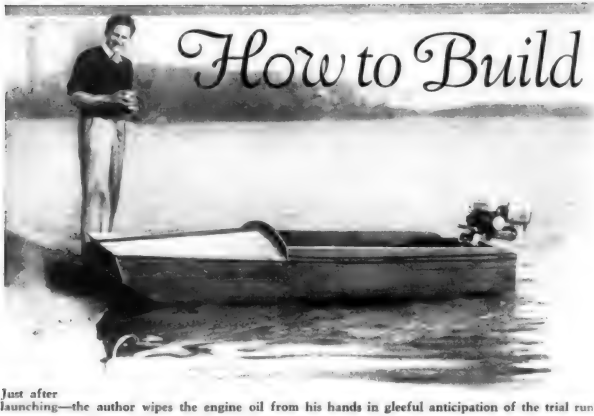
HERE is a can that serves more than one purpose. In fact, its very multiplicity of uses emphasizes its novelty as well as utility. As the illustration shows it cannot only be used to fill up the radiator but also as a shower for the car in washing, for watering the garden or lawns and for other sprinkling. The water is released through the squared spout on the side of the top and through the regular outlet. When not in use, the square spout—which is perforated—can be sealed with a sliding plate set in rubber runners to prevent leakage.



This many purpose watering can has spouts in the side and top. The square end is perforated.

The handles are situated on the side under the spout and in the center of the top. Its easy handling is shown in the picture.

# How to Build



Just after launching—the author wipes the engine oil from his hands in gleeful anticipation of the trial run.

*by* **WESTON FARMER**

*Naval Architect*

THE history of this design is an interesting one. Really, the hull of *Sez You* is an adaptation of a design for which Bruno Beckhard, the outboard motor maestro of Brooklyn was responsible. Back in the days, not so very long ago either, when the outboard motor was a new and wonderful thing barely capable of making a hydroplane plane, Bruno started experimenting with flat bottom water wagons, v-bottom hydros, and heaven knows what not. Out of it all he evolved a boat which Jerry White, then editor of *Rudder* and now editor of *Motor Boat*, published as a how to build article. This original boat which was the combined efforts of White and Beckhard was called *Nize Baby*. She went like the deuce, and was the same dimensions over all as is *Sez You* here. But—and there's the rub—the Sea Sled Company, zealous prosecutors of the patent rights of their company, claimed that the design was an infringement of the Sea Sled patents, and considerable annoyance was caused for all concerned. I reasoned to Clotilde, my pocket data book, that half of the *Nize Baby* designs remained at present unbuilt due to the misunderstanding caused by this controversy.

Knowing that the secret of *Nize Baby*'s performance was not in the concaved sections but was rather in the longitudinal reverse curve to the bottom which was transversely as flat as a pancake aft of amidships anyway, I figured that a design could be calculated from the old *Nize Baby* idea which would fulfill the function of *Nize Baby*, and yet be just straight boat, with a flat bottom and no outside frills to tread on other people's toes. Then every one could build one, and have sport for fair. So *Sez You* is the result.

And to prove her, we built her and tested her out on the waters of Lake Minnetonka not so long ago. And does she go! Say, mister—like a hot penny on a greasy pan says me!

Of course, all boats have a history, and the history of the name is interesting too. I put the proposition up to MODERN MECHANICS, and the general reaction was negative. Everybody thought that no boat that size, four feet by eight feet, could be practical, but I pointed out to the editors, who by the way are as fine a bunch of young

# "SEZ YOU!"

**Build yourself this little boat and race it with a low powered outboard motor! One of the greatest thrills of a lifetime is waiting for you when you are at the tiller of a Sez You hull. The lumber should cost but fifteen dollars or so, and it is dead easy to build, say we.**

**Square, almost, like a mortar box—that's Sez You! The utter simplicity of her design is clearly shown in this picture, taken just before launching.**

**Top photo—Sez You's engine idles her into deep water with Westy Farmer at the tiller just after the launching, shown above, in Wise's lagoon, Lake Minnetonka.**

men you'd ever hope to meet, that as long as the bottom area was there the boat could plane and be satisfactory. The fact that the hull weighs about 125 lbs., and is heavy so as to withstand lots of abuse, and that the motor and crew bring her loaded weight up to about 400 lbs., or a loading of about 100 lbs. per h.p., didn't seem to affect her planing ability the day we tested her with a 4 horse Johnson. So, as the editors were sayin' it couldn't be done, and with me sayin' it could be done, there was a lot of "Says you" and "Says me" in the parliamentary work preceding the building.

The editors, cautious, conservative, but open to conviction on anything, said it might work. I knew it would, and said so. They said, "Says you!", borrowing from current motion picture lingo, and so *Sez You* is my answer.

She can be built for about 15 dollars for lumber if you do the work yourself. Brass screws will cost a couple of dollars, but they are necessary as they are the only

## *This Cheap, Simple Boat Planes Like a Skipping Stone at 25 m. p. h.*

**With a little twin cylinder Johnson of only 4 h.p., Sez You! steps out like a Harmsworth Trophy racer. The incomparable thrill of running one of these 25 mile-an-hour scooters is beyond description. Note the extreme flatness with which Sez You! planes, and rounded lower edge of chine flats.**

things which will hold. Nails won't do the trick because they will come right out under the spanking punishment this little boat takes so gleefully. Steel screws rust out in a season.

As to speeds: the smallest motor capable of planing *Sez You* is one of rather high speed—a motor delivering 4 real honest h.p. That is the least power with which the boat, carrying one passenger, will plane. I imagine the speed is between 17 and 20 m.p.h. with this power. Two people are all that can comfortably ride in *Sez You*, and they have to crowd a little to do it. The boat will float four easily enough, but if this type of boat runs at less than planing speed it is wet and unsatisfactory for general use. Planing, she will come through quite a welter of water without much trouble.

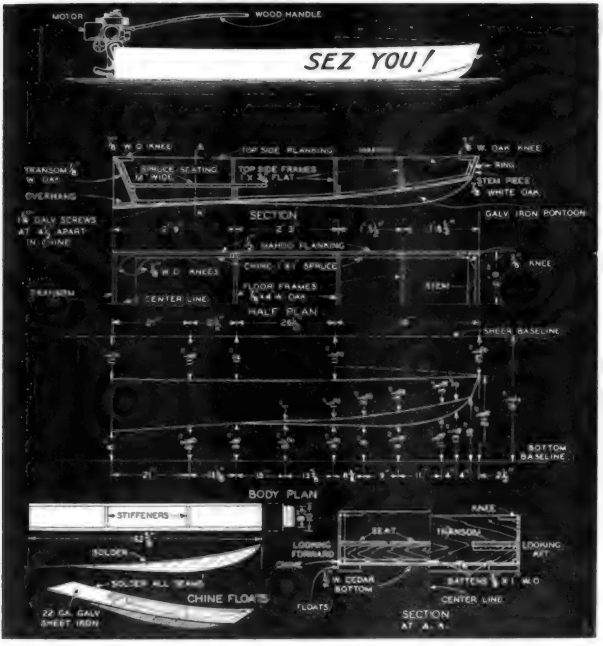
You see, the propeller in marine work seldom has a "propulsive coefficient" of more than 50%. That means that seldom does four horsepower ever amount to more than 2 h.p. actually delivered through the propeller. The reasons for this are obvious. There is propeller slip, which will account for from 20 to 25 per cent of the power loss. Then there are frictional losses which go to help swell the total of inefficiency, and the streamlined strut, interfering with the flow of water, helps out the balance. The highest propulsive coefficient I have ever known in a boat was 63%, and that was in a big boat with a big wheel and nearly 400 h.p. So that means that if you can put a 6 h.p. motor on *Sez You* you can have an effective power of 3 h.p. which is a fifty per cent increase over the power obtainable for effective propulsion with a 4 h.p. motor.

The reasoning holds good right on up the scale of power, with the efficiency falling off as the higher powers are reached and boat speed likewise. However, I do not recommend more than 8 or 10 h.p. for *Sez You* because she is short, because she takes a forty acre lot to turn when she is without a fin, and because she is quick as lightning to go into a turn when the tiller is goosed a little. She should not have too much wallop at the propeller end. I imagine her top speed is about 35 m.p.h. with 10 horsepower in racing form.

The sides are the thing to tackle first. You will note that the bottom is flat all the way across transversely. Longitudinally, along the 8 ft. length, there is a slight curvature according to the lines plans dimensions. From the full size plans which you have laid down on a sheet of building paper according to the dimensions shown on the lines on page 135, you can make a pattern which you can transfer directly to the ½-inch mahogany planking used for the topsides. The shaping of both these planks can be done at the same time, screwing them together with a few lightly sunk screws so that they can be held together without changing positions. You can take them down roughly to shape with either a drawknife or by ripping with a saw, finishing up with a plane. Mark the "cant" or slant of the transom on both boards. Then fasten the 1"x1" spruce (or oak) chine piece in, using 1½" brass or galvanized screws from the outside of the planking. Plane the edges square and fair so that the chine and the planking make a nice square face for the bottom planking to fasten to.

The next thing on the building program

## *Here Is the Blueprint With All the Necessary Construction Dimensions*



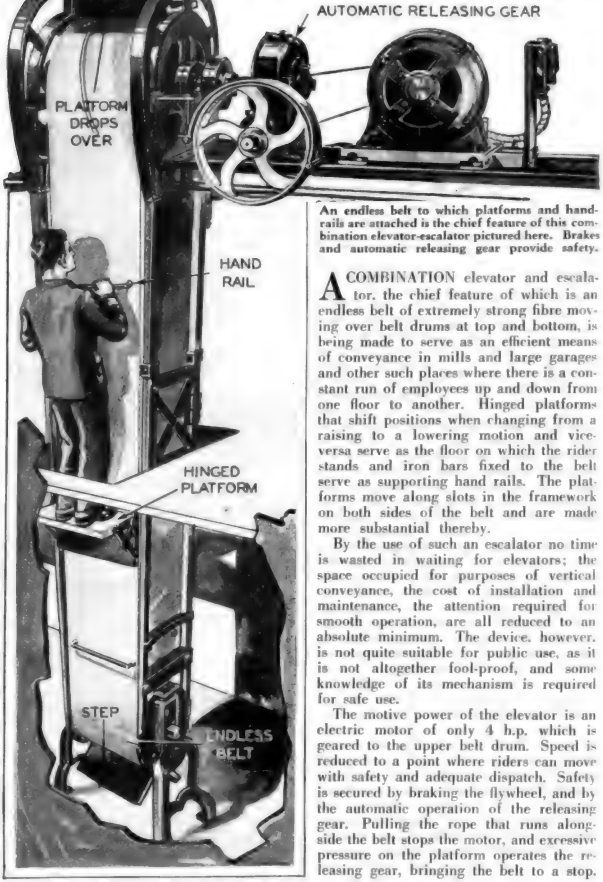

**You will note that the little racer is a simple, flat bottomed scow to which are added chine floats to give her bearing forward when running. These are not necessary, but will improve her handling qualities. They can be made by any tinsmith.**

is the making of the transom and what in an ordinary boat design would be called the stem. In this design it is the piece that slants forward, scowlike, at the bow, and serves to tie the two ends of the side planking together.

These operations are simple, and aside from cautioning you to make good fair edges, flat and with the right amount of bevel, there is nothing more to say about the manufacture of these pieces. They are fastened in between the side planks as the drawing shows. The chine piece is cut off inside and the side plank at the transom end of the boat is allowed to run right on past the transom. This gives a stern end which allows the motor to be hung inboard a trifle farther than would otherwise be the case if the transom were cut flush, and helps to bring the center of planing effort farther aft near the center of weight. Screws of fairly heavy diameter and about 2½ inches long should be put in on 1½-inch centers

*(Continued on page 198)*

# UP or DOWN by BELT



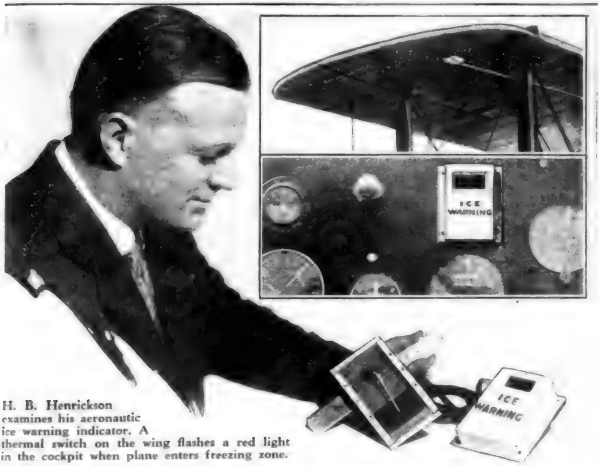

**An endless belt to which platforms and handrails are attached is the chief feature of this combination elevator-escalator pictured here. Brakes and automatic releasing gear provide safety.**

A COMBINATION elevator and escalator, the chief feature of which is an endless belt of extremely strong fibre moving over belt drums at top and bottom, is being made to serve as an efficient means of conveyance in mills and large garages and other such places where there is a constant run of employees up and down from one floor to another. Hinged platforms that shift positions when changing from a raising to a lowering motion and vice-versa serve as the floor on which the rider stands and iron bars fixed to the belt serve as supporting hand rails. The platforms move along slots in the framework on both sides of the belt and are made more substantial thereby.

By the use of such an escalator no time is wasted in waiting for elevators; the space occupied for purposes of vertical conveyance, the cost of installation and maintenance, the attention required for smooth operation, are all reduced to an absolute minimum. The device, however, is not quite suitable for public use, as it is not altogether fool-proof, and some knowledge of its mechanism is required for safe use.

The motive power of the elevator is an electric motor of only 4 h.p. which is geared to the upper belt drum. Speed is reduced to a point where riders can move with safety and adequate dispatch. Safety is secured by braking the flywheel, and by the automatic operation of the releasing gear. Pulling the rope that runs alongside the belt stops the motor, and excessive pressure on the platform operates the releasing gear, bringing the belt to a stop.

# Ice Warning Another Addition to Plane Safety Devices




**H. B. Henrickson examines his aeronautic ice warning indicator. A thermal switch on the wing flashes a red light in the cockpit when plane enters freezing zone.**

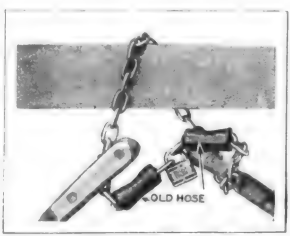
H. B. HENRICKSON, Aeronautic Instrument Section, Bureau of Standards, has designed a device which indicates when an airplane is flying through ice-forming zones, thus warning pilots.

Barely larger than a hand, the indicator flashes a light behind a red window when the plane enters a region where temperature lingers between 28 and 32 degrees Fahrenheit. Flight tests conducted by the N. A. C. A. have indicated that 32 degrees is conducive to ice formation, although the moisture present is a factor for consideration. While this indicator is primarily a temperature-indicating device, its range is limited to the zone between 28 and 32 degrees. It is only within this range that the red light is flashed.

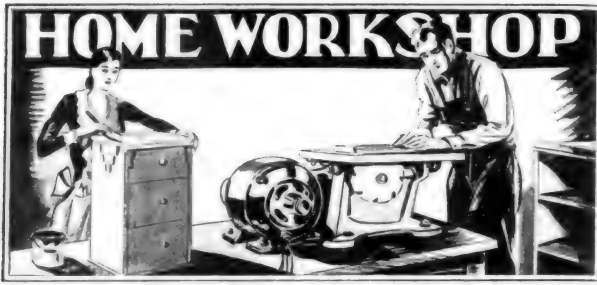
Flashlight batteries are enclosed within the box holding the warning lamp. The pilot has only to glance at the indicator, conveniently placed in the cockpit. A thermal switch is exposed in the free air stream. This temperature-actuated switch controls the light.

## Makes Lock Chain Easy to Handle

THE end links of a lock chain are aggravating things to handle in cold weather. Take two short pieces of hose. Draw the back end of the first link firmly against the end of the hose, making it stick out rigidly.




**The piece of old hose will cause the end link to stand out, making it easy to fasten the lock.**

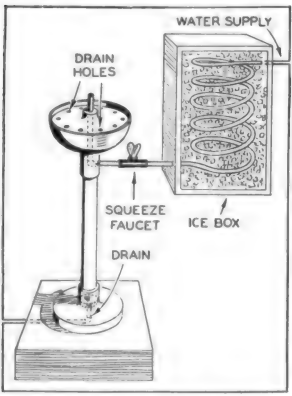



Edited by A. NEELY HALL

**For years Mr. Hall has been writing handicraft articles which have won him a secure place in the hearts of thousands of young craftsmen all over the world. He edits this department every month and in addition finds time to write such fine books as "Carpentry and Mechanics for Boys," "The Big Book of Boys' Hobbies," etc.**

## Make a Cool Water Drinking Fountain for Your Shop

EVERY workshop can use a handy drinking fountain like that shown below. Indeed, such a fountain can be installed to advantage in the cellar at home, in your back yard garden, or in similar locations. The construction of the fountain is simplicity itself, and the parts required can be obtained cheaply.



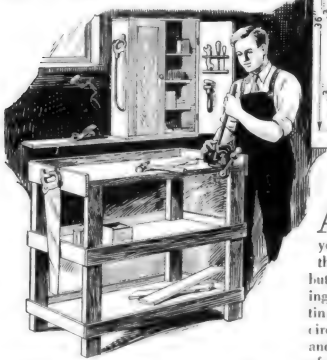

All necessary details of the fountain are shown.

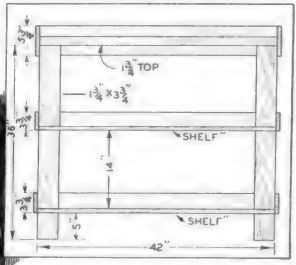
The rear axle of an automobile is used for the fountain proper, the differential case forming the bowl. A circular metal plate in which holes are punched to permit waste water to drain through is next cut and soldered into place as shown in the drawing. In most types of automobiles the rear assembly contains the brake drum of the wheel in such a fashion that it can be used as an excellent base for the fountain.

The source of water supply is tapped and the pipes led through a refrigerating box, being coiled in corkscrew fashion so that a large area is presented to the ice. Now all that remains is to run the pipe through the differential casing and attach a squeeze faucet in a convenient location. A drain pipe carries the waste water away. Construction of various units will, of course, be dependent on the type of rear axle assembly you are able to procure. In packing the ice cabinet be sure that the pieces are rather finely broken up so that they will fit snugly around the pipes. The fountain will pleasantly surprise you with its cooling efficiency.

# A Small Combination Work Bench and Storage Cabinet

YOU will find this bench handy for a corner of the garage or workshop, the shelves to hold oil cans, grease cans, boxes of bolts, washers, nails, lamps, spark-plugs, and other parts, the top for an iron vise and working surface, while a rack may be placed on the wall back of the bench to hold wrenches, screwdrivers, hammer and other tools.





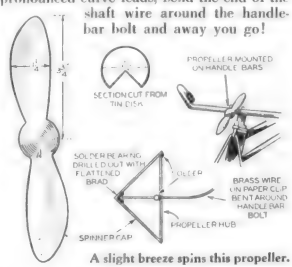

The completed bench is shown in the illustration, with a cross-section drawing. The legs are 2-by-4s, the top may be a piece of 2-by-12 and a piece of 2-by-4, or wider piece, according to what width of top you want. The shelves are of ⅞-inch stock of the same width and length as the top pieces. The top apron strips are of 1-by-6 boards, the shelf apron strips are of 1-by-4 boards.

To assemble the bench, first fasten the apron strips to the legs. Then cut the top planking and spike it to the legs, cut the shelf boards, notch their corners to fit around the legs, and fasten them between the apron strips. Diagonal strips may be nailed to the back and to the ends, for additional bracing.

Dimensions can be varied to suit individual needs, depending on the space available for the bench and on the height of the workman who is to use it. The height given is suggested as being well fitted for average use.

## Toy Propeller for Bicycle

A NEAT little propeller that revolves in the slightest breeze can be made for your bicycle from a strip of bright tin. Cut the blades and hub as per the outline shown, but do not bend the blades until all soldering is done. The spinner cap is simply a tin cone, made by cutting a section from a circular disk, drawing the edges together and soldering in place. Put several drops of solder in the base of the cone, and with a brad or piece of steel wire flattened on the end drill a socket for the shaft bearing. Put a drop on the shaft just in front of the hub so the shaft will not come out. Now solder the cone to the hub on the back side. By cutting notches for the propeller blades the cone will fit the hub more snugly. Bend the blades so that the edge with the more pronounced curve leads, bend the end of the shaft wire around the handle-bar bolt and away you go!




**A slight breeze spins this propeller.**

# Entrance Arch Adds Greatly to Beauty of Any Garden

There's an extra thrill in entering your garden through an archway like this.

HERE'S that garden entrance arch that Dad has promised each Spring but has not found time to build. It is one of the projects looked upon as a two or three-day job, but which can be knocked together in an afternoon. What say you to shaping it up as your contribution to the home plant? After your indoor model making of the Winter, this large-sized job in the open will be a pleasant change.

This side elevation of the arch gives dimensions.

The diagram stripped into the photograph on the opposite page is a front elevation of the garden arch. You will see that the arch consists of two frames joined laterally by horizontal strips. The arched tops of the frames are built up of segments cut from 7/8-inch stock. Four segments of the dimensions given in the drawings are required for each. Stock 1¾ inches thick might be used in case of necessity, but the thinner material is easier to cut, and the ends of the doubled pieces may be lapped to make the splices, whereas pieces of single thickness would have to be halved on the ends for splicing. The doubled 7/8-inch pieces make as strong a job as single 1¾-inch pieces would, when well nailed.

As you will see by the drawing, the segments can be laid out upon 1-by-10 boards, but there is less waste in using 1-by-12 boards, and interlocking the pieces. Prepare a cardboard pattern, describing the two arcs with a piece of string with end loops 24 inches apart, a nail slipped through one loop for a center, a pencil through the other loop.

If you own a band-saw, or have access to one, it will save time to use it for cutting the segments, but it is no trick to rip out the pieces with a hand-saw if that is the only saw available. Saw close to the lines, not on them, then smooth up the sawed edges with a wood rasp and sandpaper.

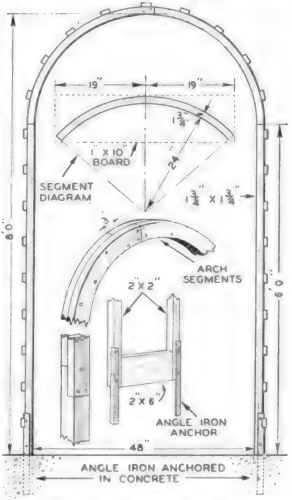
When the eight segments have been cut, nail four of them together for each frame, overlapping the ends a distance of 3 inches to make a strong splice.

The frame uprights are 2-by-2s 6 feet long, with tops notched to receive the ends of the segments. The crosspieces are 1-by-2s 20 inches long. There are twenty-nine of them. The two base blocks which connect the uprights are 2-by-6s 11 inches long.

To assemble the garden arch, spike the frame uprights to the ends of the base blocks, and nail crosspieces temporarily across their upper ends. Set up the pairs of uprights 4 feet apart, plumb them, brace with diagonal strips, and fasten the arches in the notches.

Before nailing the crosspieces to the frames, scribe a line 4½ inches from each end, the line of the inner surface of the frames, to guide in placing the strips, and cut two blocks 5¾ inches long for spacers, to guide the spacing up and down. First, nail the top crosspiece across the center of the frame tops. Then, using the spacer blocks, nail the other strips in place.

## *Arch Segment Shaping Important*



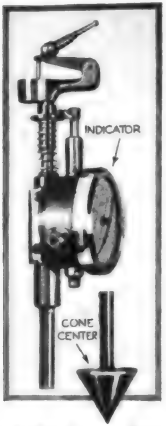

**Shaping of the arch segments to the dimensions shown here is one of the most important operations in constructing the arch.**

The drawings show the garden arch anchored by strips of angle iron, screwed to the uprights and set in concrete footings. Instead of anchoring the arch in this way, you may make the uprights long enough to set about 18 inches into the ground, or to set into concrete footings. If you do this, paint the ends with creosote or tar to prevent their rotting.

Finish the arch with two coats of paint.

You will notice that the photograph on the opposite page shows a wren house suspended from the top center of the arch. This makes a pleasing addition to the entrance, especially when finished in some bright color in contrast with the archway. The picture is sufficiently clear and the design of the birdhouse so simple that you can easily duplicate it, improving on it with a little effort.

# A Few Handy Tools and Ideas for




Changeable center finder for jig boring and milling.

ONE of the first new ideas that trickled across the Editor's desk this month was a recently developed center finder. It is proposed for use in centering holes and locating buttons on jig boring and milling machines. They are made to use a 1½" dia. .300" stroke especially arranged dial indicator. Interchangeable feeler fingers are available in sizes up to ¾" holes, 1½" holes and 3" holes. Work may be centered as close as .0002 inch.

AN interesting micrometer that has come to our attention recently is one that measures ten-thousands with the ease and simplicity of an ordinary caliper gauged to measure thousands. It is rather simple in design, having a solid anvil, while its thimble makes easy an adjustment to compensate for wear on measuring surfaces. This adjustment can be securely locked. It is free from gears and other intricate mechanisms. Widely spaced graduations make it possible to estimate even parts of ten-thousands.

Ten-thousands can be gauged quickly and accurately with this new lockable micrometer caliper.

AN organization specializing in scaffolding ideas is responsible for a new ladder that is fitted at the top with slots for holding tools, nails and screws. There is no danger of the tool kit falling from the top as all necessary equipment can be dropped into the slots. The ladder is of a safety design and is equipped with an ample platform. It is of the spreader type, the top step being a wide platform.

This ladder is slotted for nails, screws and tools.

RUBBER can be fastened to wood with a cement made from one ounce of pulverized shellac in 9½ ounces of strong ammonia. This solution must be kept tightly corked. It is not very elastic, but may be made more so by the addition of small quantities of finely-ground pure rubber.

Instead of screws or levers this square end saw handle holds the blade with a removable plunger.

CHANGING saw blades is considerably simplified by the introduction of a new type of handle that, instead of screws or levers, holds the blade in the handle by a plunger. Pressure on the plunger releases the blade which can be inserted either way —with teeth up or down. The top of the handle has been squared to do away with interference when the blade is removed. Easier and faster cutting is assured by the taper ground blade.

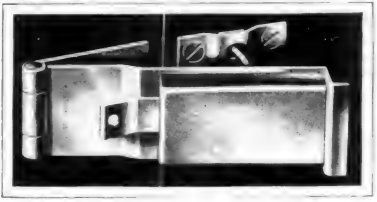
# the Modern Mechanic's Workshop

THOSE men who have found it necessary to use large, heavy, uncomfortable gas masks and safety devices in their work will welcome the addition of this respirator to the lists of worthy shop ideas. It is very low in weight—only about eighteen ounces—and mighty comfortable to wear beside providing all the safety factors. At either side of the mask aluminum ports are provided for used air. The air line to the spray gun supplies the air for the mask but it filters it before it is inhaled. In that way all moisture and odors are removed.

Light respirator supplied from the spray gun line.

This device should do away with many cases of lead poisoning caused by workmen thoughtlessly discarding the awkward and unwieldy respirators formerly used for this kind of work. It is especially designed for those engaged in spray paint coating with an air gun.

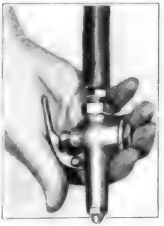
A NEW hinge hasp lock that takes the place of a padlock and hasp is another new and interesting item that has come through recently. It can be used on outside doors and chests or boxes and can also be used as a night latch for inside doors. The key is kept in place and used as a catch which may be released by pressing.



This fool-proof hinge hasp lock can be used in many ways.

A French inventor has devised this wood carving idea to eliminate many tools formerly needed.

THE question of modelling in wood has been simplified with a draw-plane recently introduced in France. It permits the workman to make whatever curve he wishes by shifting the plane's position. It eliminates a whole series of tools usually needed for this type of work. A short amount of practice gives the amateur ability to do a wide range of work.

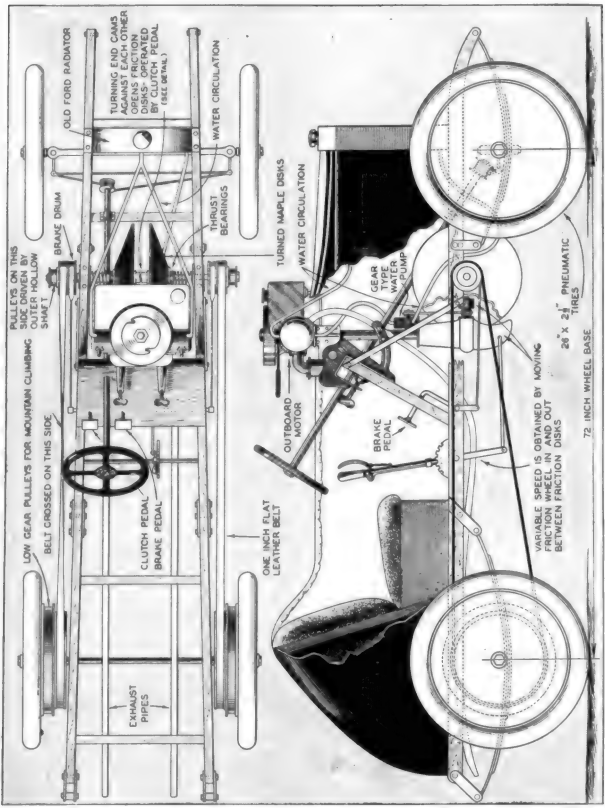


An air-saving nozzle that is form-fitted to the hand.

THE air gun nozzle shown above prevents air waste in the removal of dust, dirt and filings. The easy curve lever gives the hand a comfortable rest. When the gun is opened a bevel shoulder on the spindle sets tightly and further prevents the loss of air.

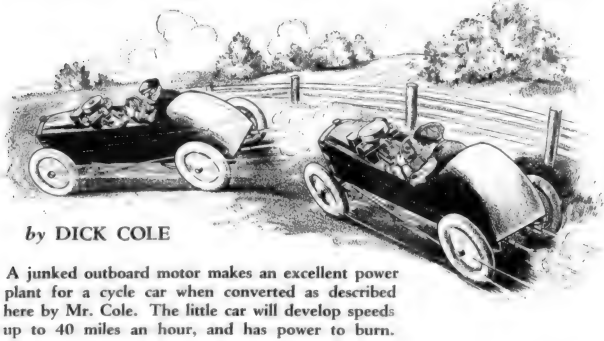
READERS interested in any of the items mentioned can have the names and addresses of the manufacturers by writing to MODERN MECHANICS, Minneapolis, Minnesota, and enclosing a stamped, self-addressed envelope.

# Outboard Motor Car




Dimensions are not given in this drawing, since they will vary somewhat with individual builders.

# Does 40 Miles an Hour



*by* DICK COLE

**A junked outboard motor makes an excellent power plant for a cycle car when converted as described here by Mr. Cole. The little car will develop speeds up to 40 miles an hour, and has power to burn.**

TO BE the possessor of a self-propelled vehicle is the ambition of every normal boy. Every father has heard the plea of his son when out in the country in the family car: "Gee, Dad! Lem'me drive, will you? Please! I know how! Honest I do! Lem'me show you. Please, Dad, come on!"

My boy had just reached that stage—only more so. He begged me to build him some kind of vehicle that would "run by itself." Since I like to putter around and make things—particularly something different from the other fellow—I gave ear to his pleadings, and began to think the matter over.

An electrically driven car suggested itself, but nothing less than a 32-volt motor would be satisfactory, and the batteries for 32 volts would be heavy and make the car cumbersome to handle.

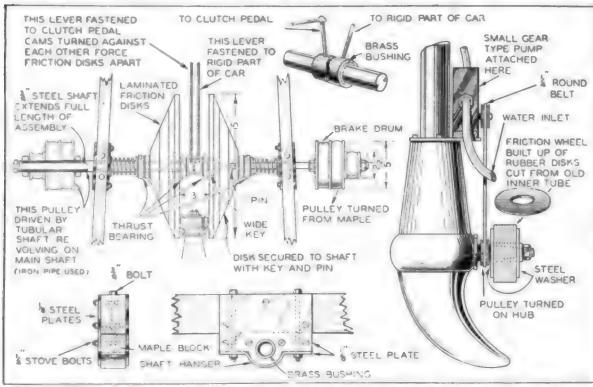
An idea! Tucked away in a corner of my garage was an out-of-date light-twin outboard motor. It was out-of-date only because it lacked the power of its present-day cousins. Nowadays an outboard under 10 h.p. is strictly passe in water motoring circles, so the little "putt-putt" had been retired from active service. Why not drive a cycle-car with the outboard motor? The idea took tangible form and developed. The ultimate result was a practical and dependable miniature motor vehicle. So dependable, in fact, that "the boy" ventures far from home with it—used it on a two weeks' camping vacation—and delights in climbing all the hills in the vicinity—and there are *some* hills.

The drawing shows the plan and elevation of the unique car. The sketches are not offered as detail construction drawings that the prospective builder must conform to, but rather to show the general outlines of such a car, and to illustrate the means by which the outboard power is converted to traction use.

In building an outboard cycle-car, the design of the chassis depends upon what material is available to the builder. To lay down exacting specifications might run up the cost beyond a reasonable amount.

The first thing to do is to build a substantial chassis with a 72″ wheel-base and a 30″ tread. For the frame rails, 1¼″× 2″ oak or ash is recommended. Old auto spring leaves from a junk-yard will afford spring suspension. Single master leaves are sometimes sufficient for each cycle-car spring. Old motorcycle wheels are especially good. Ordinary bicycle wheels can be used, or strongly constructed baby-carriage

## *Transmission Details, Gear Pump Mounting, Shown in This Drawing*




**The cycle-car transmission with its ingenious method of speed regulation is shown in this drawing.**

wheels. The wheels should be not less than 20" in diameter.

To the rear wheels are bolted double-faced pulleys to receive 1" flat belts. These pulleys should be of such diameter as to give respectively 6 to 1 and 3 to 1 gear ratios between the driving and the driven pulleys. These pulleys can be turned from maple, preferably laminated, or a sheet metal worker can spin them. The method of attaching them to the wheels depends upon the style of wheels. The constructor must decide this for himself.

Suitable steering gear must be installed and be mounted so that the steering column will not interfere with an outboard motor set vertically on the centerline of the chassis. At a point a little ahead of the middle of the chassis, a transverse board is securely mounted across the frame and tilted forward about 60°. This serves as a mounting for the outboard motor the same as the transom of a boat.

An old Ford radiator or any other small car radiator, acquired cheaply at an auto-wrecking yard, is mounted on the front of the chassis. Provision must be made for water circulation, but the detail of this will be taken up later.

We now come to the very essential unit of the cycle car—the transmission. A second drawing shows this in detail. The drawings are practically self-explanatory. The main shaft is of ¾" cold-rolled rod. One friction disk is secured rigidly to this shaft. The other disk is locked to a tubular shaft made of 1" iron pipe which turns on the main shaft and also in its own shaft hanger. Anyone with a home workshop lathe can turn out the friction disks and the drive pulleys. The bushings and the thrust bearings can be picked up in an auto junk-yard for a few cents. Front wheel bearings from an old model Ford will serve as suitable thrust bearings. Stiff valve springs from a scrapped heavy-duty motor will serve as tension springs against the friction disks. Provision must be made for oiling all the bearings.

It is necessary that the friction disks be spread apart to permit the entry of the friction drive-wheel between them. This is done by turning two end cams against each other, as shown in detail. One cam is held stationary by attaching its lever to a rigid part of the car. The other is turned against it by depressing the left foot pedal. The right pedal contracts a brake-band around

*(Continued on page 204)*

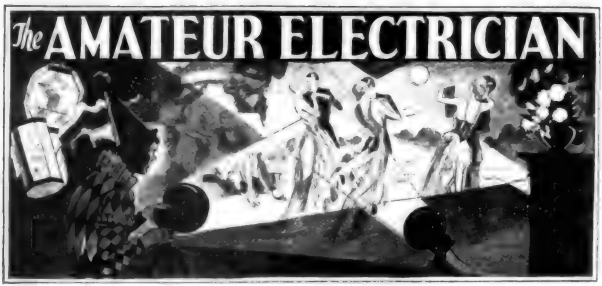
# Modern Equipment to Fight Fires

This pack pump is capable of pumping thirty gallons of water a minute from streams or wells.

This tank truck pumps 150 gallons a minute and throws streams a distance of ninety-six feet.

The Hauch torch for back firing is shown in action. The tank strapped on the back carries chemicals which ignite when combined with air. Note handle which keeps nozzle at distance.

THE very latest of modern forest-fire fighting equipment has recently been procured by the Los Angeles County Forestry Department for fighting the numerous and costly forest and brush fires which are common to the Western states during the dry season. A tank truck capable of a speed of fifty miles an hour is used for quickly reaching the scene of the fire. It may be quickly refilled from the streams or wells and pumps several streams of water to a distance of 96 feet. For fires unapproachable by truck, a pack pump has been devised which pumps thirty gallons of water a minute. Back firing, a common method of fighting large brush fires, is speeded by use of the Hauch torch. It is estimated that this equipment will save Los Angeles millions of dollars a year.

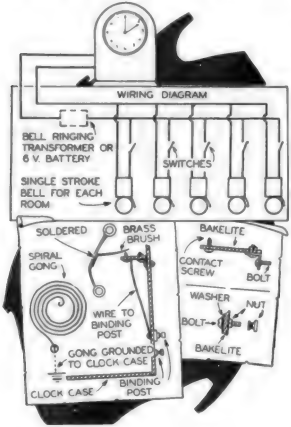



Edited by THEODORE ALLEN

**It doesn't take a lot of equipment to have lots of fun experimenting with electricity—perhaps that's one of the reasons for the popular appeal of this monthly department of Modern Mechanics. Mr. Allen, an expert in everything pertaining to electricity, this month presents a number of interesting projects for the amateur experimenter.**

## Master Clock Strikes Hour Gongs Throughout House

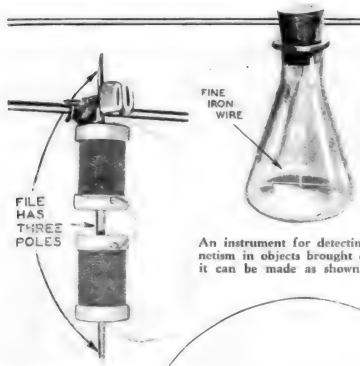
INSTEAD of having several clocks in the house striking ragtime, the clever craftsman can arrange one master clock to strike the hour in as many rooms of the house as he desires. Choose a clock with a spiral gong. Ground this gong to the metal frame of the clock or, if it is a wooden case, solder a wire from the metal part of the gong support to a binding post in the back of the case.




Then solder a light piece of brass, very flexible, to the striker arm about where shown, depending on the shape and style of this arm. Place it near the pivot and point it towards the nearest side of the case. There should be about an inch to spare. The contact point consists of a brass screw projecting up through a small piece of bakelite or fiber held horizontally to the clock case by a small angle bracket. Wire the screw head to second binding post *insulated* from the case through a fiber tube or washer.

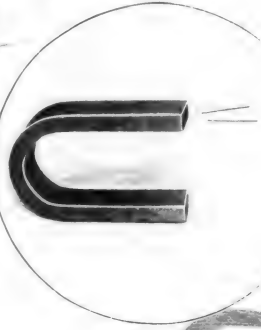
Now adjust the brass brush on the hammer so that when the hammer swings to the gong the tip of the brush will make a light contact with the screw tip in the bakelite slab. This is sufficient to complete the circuit, as outlined in the sketch, and ring each one of the several bells at the same time. A single stroke bell will prove most satisfactory. Any oscillating bell can be changed over into a single stroke bell by removing the wire leading from one binding post to the vibrating adjustment screw and attaching it to the open side of the magnets.

# Perform These Interesting Experiments With Magnetism



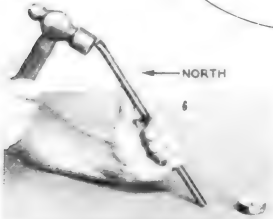

An instrument for detecting magnetism in objects brought close to it can be made as shown above.

This magnet above apparently has three poles. It consists of a file passed through two coils of wire so arranged that current flows through the coils in opposite directions. The ends of the files will have the same magnetic pole; the middle will have the opposite polarity.

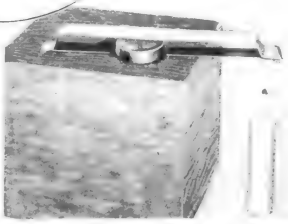


Needles magnetized by rubbing them across a horseshoe magnet repel each other when suspended close together.

At left — The same magnetized needles, brought near a horseshoe magnet and supported at one end by string, can seemingly be made to hang in mid-air.




Hold an iron bar in the position shown, strike a sharp blow on its upper end, and it will become magnetized, as proved with a compass needle.



A strip of galvanized iron and one of copper, pinched together as shown, will develop a detectable electric current when heated on one end.

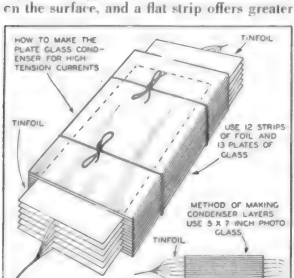
# A Simple Lightning Machine

*by* **THEODORE ALLEN**

**Artificial "lightning" bolts a foot or more in length can be produced with this ingenious little machine, which also performs a number of other interesting stunts. It is perfectly safe to build and use, since it runs on low ampere currents.**

WITH the Tesla coil described herewith you can make small-scale reproductions of the twelve-foot lightning bolts produced in the laboratories of the General Electric Company where the famous scientist Steinmetz carried on his experiments. The Tesla coil, so named from its inventor, takes a high tension current and steps it up still higher. Because it uses a current which has high voltage and practically no amperage, it cannot shock anyone or produce any injurious effect.

The primary of the coil is made of eight turns of No. 8 or 10 B&S bare copper wire. This is the drum around the central winding and is supported by the wooden rings and framework shown in the diagrams. An inch gap is needed around the core to keep the high tension current from jumping across from the primary and shorting through the winding of the secondary. Wires of the primary are spaced 5/16 inch apart. Flat copper or brass strips are ideal for this winding, since high tension currents travel only on the surface, and a flat strip offers greater area. Windings for the primary are led to terminals as shown, where you will fasten the high tension leads from the spark coil.

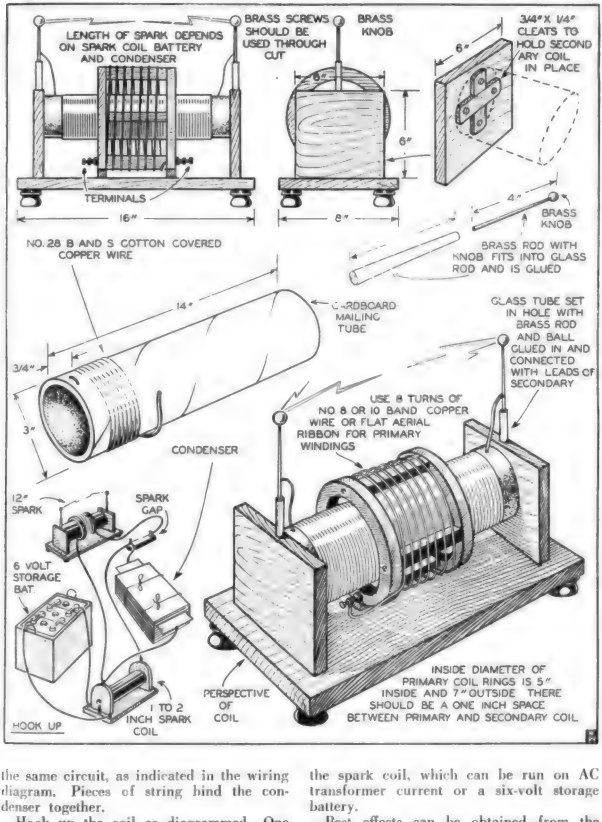



**Thirteen 5x7 glass plates and twelve heavy sheets of tinfoil are used in making the condenser.**

The secondary is wound around a mailing tube 3 inches wide and 14 inches long. Begin about ¾ inch from the end and wind tightly and closely with No. 28 B&S cotton covered copper wire, after the tube has been shellacked and baked dry. End the winding ¾ inch from the other end, run the loose end through a hole in the drum, and let it project about 8 inches to fasten to the brass gap rods. Make the coil bed 1x8x16 inches out of pine, dried in an oven and shellacked so that it is well insulated. The end rests for the coil are 6 inches square, with cleats as shown to hold the coil. Brass screws, being non-magnetic, are used in assembling. The assembled unit rests on porcelain legs, glued on rather than screwed in place. High tension current travels nearly as well in wood as in metal, except when it is dry and well shellacked, and screws would form a path for the current.

Next make the ends for the gap, out of hollow glass stirring rods, obtainable at any drug store. The rods are a quarter inch in diameter and six inches long. They hold the brass rod and ball from which the sparks are drawn. The ends of the secondary are soldered to the brass rods. They are glued into the glass tubes so as to be insulated from the carriage of the coil.

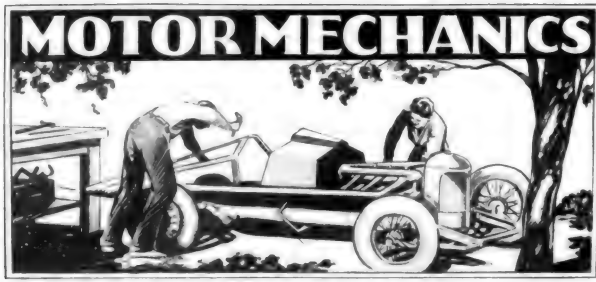
Now you must make the condenser, which is a simple one. Obtain 13 glass photo plates, 5x7 inches in size, and wash off the emulsion from them. These plates can be obtained from any photo supply house, or you can have the glass cut to size from large sheets at your local hardware. Twelve heavy sheets of tinfoil are required, placed between the glass plates as shown in the drawing, with about half an inch of the glass projecting over the foil on three sides. Every other sheet of foil is connected with




the same circuit, as indicated in the wiring diagram. Pieces of string bind the condenser together.

Hook up the coil as diagrammed. One lead goes to the primary coil high tension lead from a good-sized spark coil; the other is led to a spark gap, then to the condenser, and then to the other high tension lead on the spark coil, which can be run on AC transformer current or a six-volt storage battery.

Best effects can be obtained from the lightning machine in a dark room, but daytime results are effective too. You can draw sparks from the coil, light broken electric lights, and do other interesting stunts.



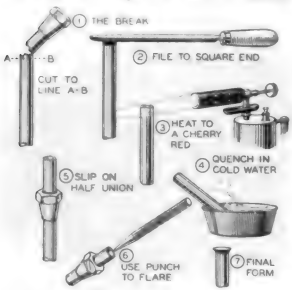

Edited by RAY F. KUNS

**Mr. Kuns is nationally known as editor of the Auto Digest, trade journal of the automotive industry, and for his helpful articles in technical magazines intended to show the motorist how to get the best service out of his car with the least trouble. This department is a regular monthly feature of Modern Mechanics.**

## Making Repairs of Broken Fuel and Lubrication Lines

IMMEDIATELY a car is put in service, vibration starts the crystallization process with the final result that cracks and breaks occur in the fuel and oil lines. These may occur on the road, and as a rule, may be readily repaired. If the break is in the center of the line, wipe off all the oil and dirt, and tape it with friction tape. This will hold temporarily, until you can get to a service station.

A permanent repair is made as shown.




Steps in making permanent repair of broken line.

First cut off the tubing at the line A-B. Next file the ends of the tubing square, as shown at 2. Use a blow torch to heat the end of the tubing to a cherry red. Quench the tubing in cold water, as shown at 4. Next slip the half union in position as shown at 5, after which a center punch or other round bar is used to flare the end of the tubing which will take the final form shown at 7.

It is good practice to anneal the entire length of tube by heating with a blow torch and quenching in cold water. This will add to the life of the copper tubing.

### Cleaning the Car's Upholstery

DUST and dirt collects easily on the upholstery of closed cars, and the home vacuum cleaner can't be beat for removing this dirt. Small size home cleaners are especially handy for this job. After cleaning, the nap of the upholstering material may sometimes be restored to life by steaming with a damp cloth, after which it is brushed.

### Tube Holds Windshield Wiper

MANY motorists put up with the constant annoyance of a windshield wiper which will not stay put when not in use. A length of 5/16" copper tubing, slipped onto the handle on the inside of the car, will do away with this trouble.

# Leather Belting Lever Removes Stubborn Lamp Rims

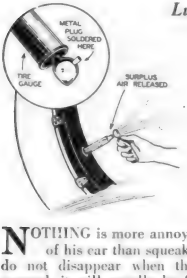
ALMOST every one has encountered the stubborn lamp rim which refuses to budge. These rims must be removed when installing new bulbs, polishing the reflectors, or replacing the lens. When a rim is encountered which refuses to be loosened by ordinary methods, make a device similar to that shown in the photo at the right. This is a piece of leather strap or leather belting 1" or 1½" wide, bolted to a wood handle so that when the handle is in the position shown, the leather is quite tight around the lamp rim. Ordinarily a good pull on this tool, which secures a strong grip on the rim, will do the work.

Hub caps which have no provision for a hub cap wrench may be removed with a tool similar to this.

A leather strip fixed to handle loosens rims.

## Check Front Tires for Wear

IF YOUR front wheels are out of alignment, wearing the tires away too rapidly, the fact can be discovered by feeling for sharp edges on the non-skid projections on the tire. Wheels out of alignment will wear one edge sharp, and in especially bad cases this edge will be turned over and feathered out.

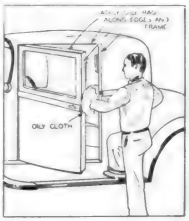



## *Lug Soldered to Tire Gauge Makes Air Release Easy*

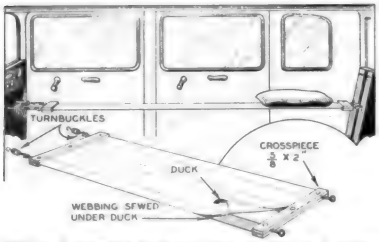
EVERY motorist knows that tires cannot be expected to give the length of service that their makers have built into them unless they are kept inflated to the recommended pressure. In putting air into tires at the service station, however, it is very easy for the powerful air compressor pumps to force more pressure into the tire than is desirable, and the valve must be released to permit some of the air to escape. A metal plug of such dimensions as to fit readily inside the valve stem can be handily soldered to the back of the tire gauge as shown, ready to release the valve.

## *Removing Door Squeaks*

NOTHING is more annoying to the motorist who is proud of his car than squeaks in its body. When such squeaks do not disappear when the chassis has been thoroughly greased, it will usually be found that the car doors are the source of the trouble, the edges of door and frame chafing together. A rag which has been dipped in a fairly heavy grade of oil and then pressed out so that it does not drip will frequently prove to be all the equipment necessary for removing door squeaks. Run the rag along the edges of the door and its frame, as indicated in the drawing at the right, and the troublesome squeaks will disappear. Simple but effective.



# Sleeping Cot for Use Inside Car Occupies Small Space




This cot is suspended inside the motor tourist's car as shown.

THE modern coach lends itself admirably to sleeping quarters for the tourist. It is not easy, however, to adapt the cushions into a berth. Some motorists prefer to leave the rear seat cushions at home, and some have even removed the rear upholstering or the back of the rear seat, leaving it in the home garage when touring. This is quite practical when but two are in the party. The folding front seats are then arranged to be removed from the car at night. Usually all that is needed is several removable bolts or pins.

Now for a suitable and comfortable berth. Measure up the car and purchase a piece of 10-ounce duck, wide enough and long enough for the bunk or berth. Usually this will be about four feet wide and run from six to seven feet long. Also purchase enough webbing, such as is used on upholstered furniture, to have three lengths to sew to the duck. After sewing this to the duck provide cleats for each end of the duck material. Nail the duck material to the cleats with upholstering tacks. Bolt the cleats together in pairs. Provide hooks for the rear cleats where they may be hooked onto the car body posts and provide turn buckles at the forward end so that the berth material may be drawn tight.

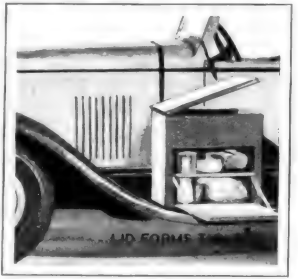
## Distributing the Load on the Car

SEASONED tourists know how to stow hundreds of pounds of excess baggage, without serious damage to the car. The prime consideration is keeping the load properly balanced. The great danger is having all the weight on one side, or overloading the rear. Remember that the left side of the car, more often than not, is the high side. If more weight is placed on one side, it should go on the left. If weight is carried on the running-boards, keep it well forward. If weight is carried on the front bumper, do not cut off the radiator core from free air circulation, especially if hard driving and danger of overheating is to be encountered.

## Running Board Trunks for Tourists Hold Food and Camp Equipment

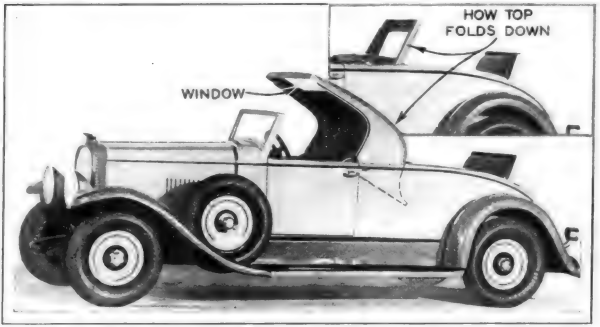
MOST tourists think of trunks as belonging on the rear of the car. In order to balance the weight of the touring load, it is sometimes possible to construct two cupboards one for either running board at the forward end of the car. Some motorists use an iron brace running from one trunk across the cowl to the other trunk, to prevent scratching. Provisions, cooking utensils, ice, bed clothes, wearing apparel and a great quantity of touring equipment may be stored in trunks such as that illustrated at right.

The home workshop mechanic may lay out his own trunk and build it from light weight spruce which is an excellent material; poplar and pine are also good. A finished appearance may be given the trunks by using artificial leather covering.



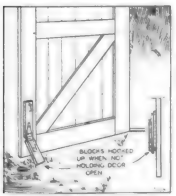
This neat, useful fender trunk is easily built.

# Car Top Serves as a Rear Seat Windshield When Down




**Sliding on a pivot and rollers, the top of this coupe tilts down to make an open car as shown.**

SOMETHING new in convertible autos is shown in the above photograph. It can be changed from a closed car to open air car in a jiffy, the top folding down into the body of the car on a pivot. A glass window, placed in the forward part of the top, serves as a transparent windshield for occupants of the rumble seat when the top is down. When the top is up the location of the window, almost directly above the occupants of the front seat, gives an observation car effect much appreciated when driving through mountain country and other places where scenery is vertical as well as horizontal.

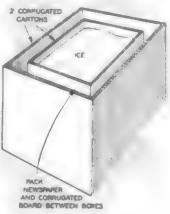



## *Flaps Hold Garage Doors Open for Backing Car*

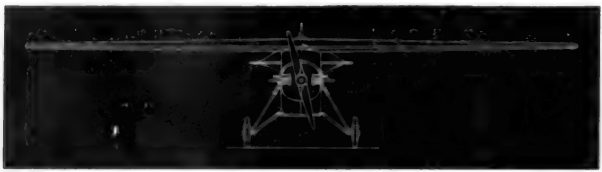
DID you ever open the garage doors, get all set to back your car out, and then discover that the wind had blown them shut behind you? This is one of those annoyances which cause motorists to talk to themselves, but it can easily be avoided if the doors are equipped with hinged wooden flaps of the type shown in the drawing at the left. Details of construction are clearly shown.

## *Ice Carrier for the Car*

WEEK-ENDS at the lake can be made much more pleasant if there is an ice-box in the cottage to keep milk and cream and butter in good condition. Many cottages in the woods are now equipped with ice-boxes, but sometimes it is a problem to secure a chunk of ice in the uninhabited regions favored by campers. An efficient ice carrier can be made from a pair of corrugated fiber boxes, as shown in the drawing at the right. The inner box should be approximately the same size as the ice cake, and the outer box large enough to hold the small one with a space about three inches wide all around. Packing this space with newspapers or corrugated board creates dead air spaces which keep the ice from melting.



# Plans for Building the



This view shows the enormously refined lines of the Dart I, with parasite pared to the "irreducible limit". The full cantilever wing is the modern thing, and is highly efficient and ruggedly strong.

**Modern Mechanics is proud to introduce the work of Ivan Driggs, one of America's most respected lightplane designers. Here in the Dart I you have a plane that is the inspiration for all the modern high wing monoplane cabin jobs—a plane engineered to army requirements that can be powered with the Heath-Henderson motor for efficient flight.**

THE *Dart I* whose construction is illustrated and described in this article is one of the most successful and practical of American single seaters. This airplane with the Henderson motorcycle engine won the greatest proportion of the prize money at the 1924 Air Races. The same design with the Wright Morehouse two-cylinder engine took part in the Ford Tour of 1926 and subsequently flew over the mountains from Moundsville, W. Va., to Washington, D. C., and from there to Philadelphia to compete in the races there. In making this flight the *Dart I* left a great many larger planes behind due to bad weather.

The only light plane at present owned by the U. S. Air Corps is a *Dart I*. It is used by the Engineering Division at Wright Field in the development of wing slots. This design was made under contract to the Air Corps and *the stress analysis has been checked by the Engineering Division*. No one need fear that this airplane, if properly constructed, will be structurally unsafe.

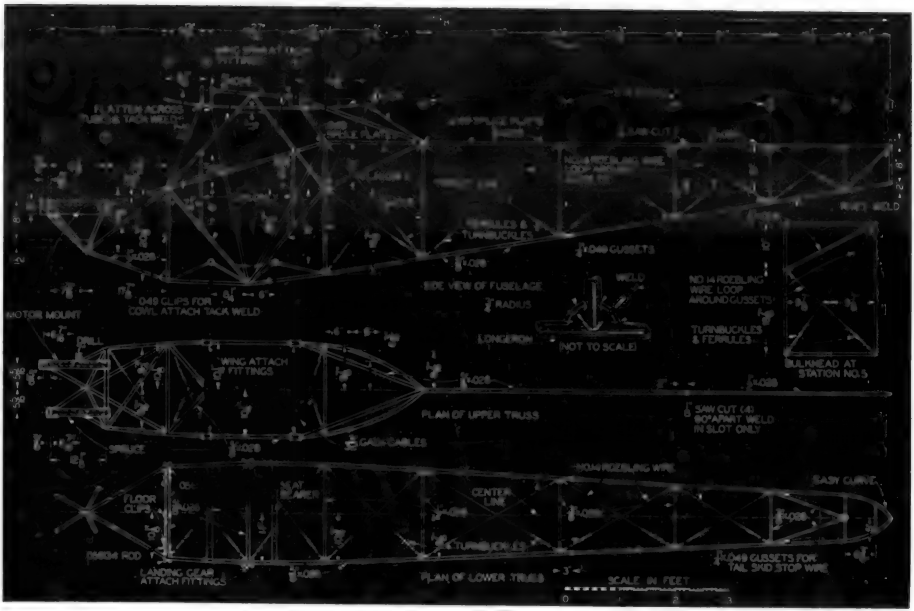
To build the *Dart I* a good knowledge of cabinet making and welding is necessary. No one should attempt it unless he possesses that knowledge or is able to engage the cooperation of one who does.

In building anything, it is usually best to begin by building the most difficult item first. Consequently we will first start the construction of the fuselage, though the wing might at first seem to offer greater difficulties. Such however is not the case, and there really is nothing tremendously difficult in the construction of the whole plane. Take two long beams that will later be used as cauls in building the wing beams, and make of them a base for the fuselage jig. This is made by supporting the beams on four saw horses, and leveling them up about two feet apart. They should be firmly nailed to the horses. Starting from the front of the fuselage, each station should be laid out with a sharp pencil on these beams, using a carpenter's square to insure that the lines are absolutely square with the center line. Then lay out the various lower cross tubes at each station. Erect at each station on both sides just at the rear edge of each bottom cross tube line a series of 2x4 yellow pine members, about 4 feet long at the rear and 6 feet long at the front. These members will support the fuselage jig proper. Thirty inches from the surface of the beams mark a line on each of these uprights. This may easiest be done by the use of a piece of wire after laying out the front and rear uprights. By stretching the wire tightly a straight center line along the sides of the uprights is insured. This line so obtained on the outside of each corresponds to the thrust line marked on the

# DRIGGS DART

by
IVAN DRIGGS
*famous plane designer*

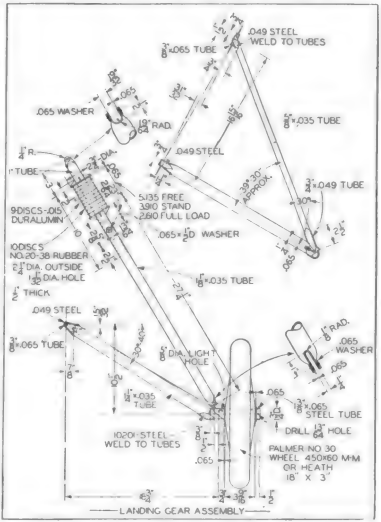
PLACED ALONGSIDE ONE OF ITS LARGE SISTERS OF THE AIR, THE TINY BUT BEAUTIFUL PROPORTIONS OF THE DRIGGS DART ARE APPARENT.


FLATTEN ACROSS FUSELAGE TACK WELD
SPLICE PLATE
.049 SPLICE PLATE
.049 CUT
FERRULES & TURNBUCKLES
.049 GUSSETS
RIVET WELD
.028
SIDE VIEW OF FUSELAGE
WELD
RADIUS
NO 14 ROEBLING WIRE LOOP AROUND GUSSETS
.049 CLIPS FOR COWL ATTACH TACK WELD
MOTOR MOUNT
LONGERON
NOT TO SCALE
TURNBUCKLES & FERRULES
DRILL
WING ATTACH FITTINGS
BULKHEAD AT STATION NO 5
PLAN OF UPPER TRUSS
SAW CUT (4) & PAINT WELD IN SLOT ONLY
SPRUCE
.028
CABLES
NO 14 ROEBLING WIRE
FLOOR CLIPS
SEAT BEARER
CENTER LINE
EASY CURVE
TURNBUCKLES
.049 GUSSETS FOR TAIL SKID STOP WIRE
LANDING GEAR ATTACH FITTINGS
PLAN OF LOWER TRUSS
SCALE IN FEET

drawing. Be sure that all uprights are square with the surface before nailing.

Next obtain some ¾x4 Yellow Pine for cross members. Measure down and up on each upright to the center line of the longeron plus one-half the diameter of the cross tube as given and securely nail these cross members on the front of the uprights. Bottom cross members at every station should be placed below the longeron and tangent to its lower surface, top cross members above. For the attachment of motor mount and wing fittings make up dummy motor bearers and wing spars and support from cross pieces. Make up fittings and properly locate on these dummy members.

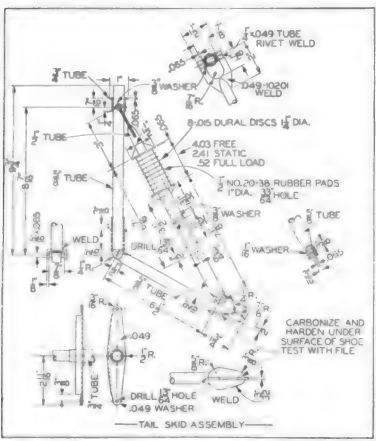
We now have a frame into which we can lay our tubing for welding. Referring to the plan view of the fuselage, lay out on the lower cross members the center line and both sides of the lower longeron clear back. Do the same for the single upper longeron. You are now in a position to cut and fit the tubes previous to welding. Obtain sufficient of the specified sizes. Specification 1025 will be satisfactory. First fit the upper longeron and fasten in place by a piece of wood with a hole in it the size of the longeron. This piece is nailed to front of top cross member in such a way that the longeron is held exactly on the lines previously laid out. Next fit in the two bottom longerons in a similar manner. When the longerons are in place and the work has been thoroughly checked, the uprights and cross members are next fitted. It is not necessary to file out the tubes to fit the longerons exactly in such small sizes. Simply cut them off square and allow about 1/32 clearance for expansion when heated. When these tubes have been all fitted, an experienced welder should tack them lightly into place. Next make up the corner gussets. These pieces can best be made by coiling the tubing around a large steel bar in a lathe, similar to the way a spring is coiled. After this coil is made it is sawed into four pieces lengthwise. Next the welder tacks in these gussets. Go over the fuselage and set in all fittings not already mentioned, having them lightly tacked into place. When all parts are in, a thorough check should be made to insure that all parts are properly located, especially the wing attachment fittings and the motor mount. When you are sure that everything is O. K., complete the welding at each joint as far as possible so as to insure that the members will not shift after removing from the jig. The splices in the rear longeron should not be welded until the last operation. When this is complete remove from the jig by sawing off the cross members. Place on horses and complete the welds at every joint. Next wire up




**The design of the Driggs Dart I is now quite a few months old, and has been tried by time. Here is the granddaddy of split undercarriages, and is simple to make, and efficient.**

and line up the rear part of the fuselage, using small buckles and the wire called for.

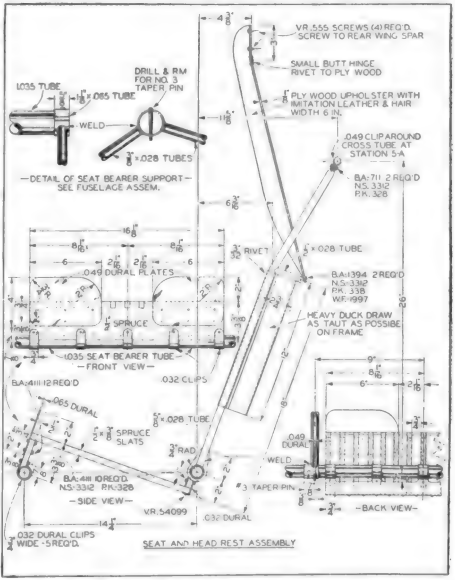
The next operation is to varnish the fuselage and to cover it. After varnishing, bolt in the spruce stick at station three, and wrap the members around the door with tape to which you can sew the cover. When covered dope with three coats of good nitrate dope and paint.




**The very clever Driggs Dart I tailskid makes use of rubber rings to absorb shock. There is little recoil in such an arrangement. Note the compression figures under load.**

The next part to make is the landing gear. The average man has a great amount of trouble in building a gear so it is true. The whole secret is in having a good jig, and the best one is the fuselage that has been completed. Support the fuselage on two horses so that the lower longeron at the gear attachment is about twelve inches from the floor. Level the fuselage fore and aft, and crosswise. Plumb down to the floor from the center of the front fuselage fitting and lay out the wheel centers on the floor. Support small pieces of axle tubes on blocks from the floor in the exact location given on the drawing. Set up the upper ends of the main axle and brace tube and bolt into fuselage fittings. By sawing at the proper angle the main axle and the stub for the wheel are made to meet properly where dimensioned. When the three tubes fit properly they should be tacked

## Seat Details Complete With All the Specifications




**Here are the side view details—all that are necessary—to build the cabin seat of the Dart. Note the beautiful engineering that has gone into this design, and how easy the parts can be made. The seat is cushioned.**

together and the fittings made up and applied. The welding on the axle should be completed as far as possible before removing from the fuselage and floor blocks. When completed each vee should be heat treated by a competent man to the specifications given. The S. A. E. number of the steel is 4130 which the heat treater will have to know. The shock tube is too simple to make to warrant any explanation. Next the tail surfaces and ailerons should be made. Obtain some ¾x6 yellow pine lumber and make jig boards sufficiently large for each surface. On these boards lay out each surface and all of its members. Make up some blocks about 3 inches high, with holes in them on center, the sizes of the various spars and leading edges. Split these blocks and nail to layout boards at suitable intervals to support spars. Be sure they all line up perfectly level. Cut spar tubes and clamp in jig to the above blocks. Then bend up rib tubes and weld in where shown. Tack as far as possible in the jig and complete welding after removal. Thoroughly varnish, then cover and dope. Be sure that all hinges properly line up on adjacent surfaces before completion.

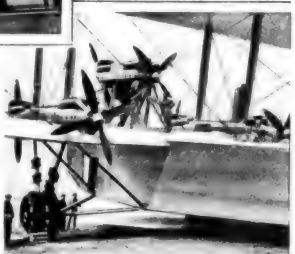
The tail skid, motor controls, seats, flooring and plane controls can now be made and installed. No jigs are necessary for these parts which can easily be made by a good welder and mechanic. No description of their construction will be given.

In the next part we will describe the making of the cowling, and the installation of the motor fuel system.

This ship has been flown in all kinds of weather, and has made long cross country hops successfully. It has a high speed, with a Henderson motor, of around 34 m.p.h., and a ceiling of about 12,000 ft. It will climb better than 300 feet a minute and is very sturdy and rugged. The ship built for the Army to these specifications is shown in a photo on page 160. We have built another, powered with a Henderson, and it is from this ship these figures are taken. The ship shown on the opposite page is powered with a Bristol Cherub and performed in every way like its bigger sisters. Full illustrations for building the wing will appear in next month's MODERN MECHANICS.

# Italy Builds World's Largest Airplane for Military Use

The photo on the left shows how the larger wing has been placed below to center the thrust and to give better control on landing. The center picture shows the giant power plant consisting of six 500 horsepower Isotta-Fraschini "Asso" engines which drive the plane at 130 miles an hour. Below is shown the double landing wheels which are six feet high.



THE largest airplane in the world, even larger than the famous German "DOX" of German build, has recently been completed by the Caproni plant of Milan, Italy, and turned over to the Italian Air Force for use as a bomber.

This plane, known as the "Caproni 6000," is constructed entirely of steel and duralumin and follows the well known general lines of the former Caproni planes. It is powered with six Isotta-Fraschini "Asso" engines developing 500 h.p. each. It has a maximum speed of 130 miles an hour and a landing speed of 55 miles, a ceiling of 18,000 feet fully loaded with 10,000 pounds, and can remain in the air ten hours.

The new Caproni is strictly a war machine, heavily armed with a clear firing field in all directions. It is designed for use in long range bombing, being capable of carrying four 1,750 pound bombs, eight 550 pound bombs, or 32 weighing 220 pounds each. The bomb release controls are electrically operated and are operated by the observer who sits in the nose of the fuselage beside one of the machine-gunners. Another machine gunner may fire to the sides and rear from a cockpit situated in the fuselage behind the wings, while the third gunner may fire downward in all directions through an opening in the bottom of the fuselage.

The pilot's cockpit, situated behind that of the observer and in line with the leading edge of the wings, is equipped with dual controls and complete instruments for navigation. The visibility is excellent, an essential quality for a machine of this size. Entrance is gained to the machine through a door beneath the pilot's cockpit.

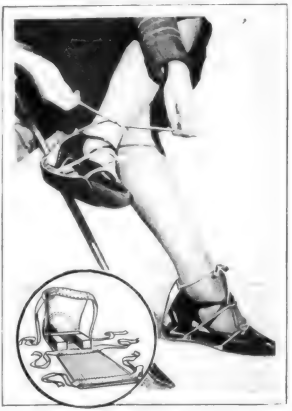
## Removing Bruises from Woodwork

BRUISES may be removed from fine woodwork if not too deep by the use of thick brown paper and warm water. Soak the paper and let it lay on the bruise, folding to bring it down approximately to size. Then apply a hot flatiron until the moisture is completely removed. If results are not obtained the first time, try again.

# Putting Greens Protected From Milady's High Heels

A GOLF course, unadorned by a sprinkling of the fair sex, would be a dreary place indeed; the ladies to whom appearance means everything, would not be quite so chic without those dainty shoes equipped with dagger-like high heels; but a putting green free from those cute little heel prints just the right size to hold a golf ball snugly would be a golfer's paradise.

So that the putter's temper might not be utterly ruined, while still permitting the ladies to appear smartly shod in the club house after a round of the ancient and honorable game, J. H. Binks, miniature golfing impresario of Chicago and Florida has perfected an abbreviated ski affair which laces over Milady's foot and protects the greens from even the sharpest heels.



A leather half-sole fitted with wooden heel cleats is tied over the shoe with tape laces as shown.

## Stainless Steel Safety Razor

SHEFFIELD, England, the home of fine steel, is manufacturing this adjustable safety razor with blades made from the finest rustless and stainless steel. A special blade sharpener, sold with the razor, permits rapid stropping of the blades. Seven blades are said to last a year.

## Glue for Celluloid Easily Made

A VERY satisfactory glue for celluloid may be made from two parts of shellac, three parts of spirits of camphor, and strong alcohol warmed before adding to the shellac. This glue will fasten celluloid together or to wood, tin and iron. Keep tightly corked.

## *Blue Streak*, Speedy Outboard Racer, Has Won Its Weight in Trophies

THE *Blue Streak*, world champion outboard racing skiff owned by Doctor Leo M. Baughman of Los Angeles, California, has won its own weight in gold and silver trophies—exactly 225 pounds. The boat is shown here balancing the beam scale against the huge collection of trophies it has won. Entered in practically every outboard regatta of any importance in the United States during the past year, the *Blue Streak* has broken nearly all records for boats of its type.

225 pounds of trophies and an equal weight of racing skiff posed with Doctor Leo M. Baughman, who is owner and pilot.

# Automatic Cradle Rocks Itself and Later Turns Itself Off

Electric motor and movable parts are out of reach of baby.

MINDING the baby has now become an automatic task to be performed by a machine. Sergeant V. D. Standley of the Tulsa, Oklahoma police force, after five years of work, has perfected a cradle which rocks itself for fifteen minutes and then turns itself off.

Power from an ordinary electric socket turns an electric motor which is completely hidden and out of the way of the baby. When the child begins to cry it is only necessary to push a button to set the crib in motion. After fifteen minutes of rocking a clockwork arrangement shuts off the motor, experiments by the sergeant having proven that it takes about that long to quiet the normal infant.

## Grapefruit Shield Saves Eyes

THE delectable but treacherous grapefruit has at last been conquered; and to Polly Moran, popular screen comedienne, goes the credit for solving the puzzle of this fruit which has so long been in the public eye. A simple metal frame attached to the plate with a wire holder supports a glass screen which intercepts the fruit juices before they can reach the eye or ruin the eater's frock and disposition.

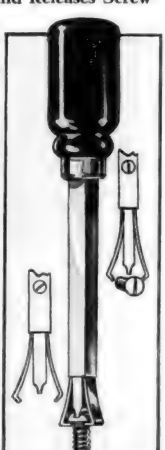
Glass screen intercepts fruit juice.

## Tool Holds and Releases Screw

A TOOL which fills a long felt want has recently been placed on the market by an eastern manufacturer. Car owners, carpenters, electricians and others who have occasion to start screws in places where it seems impossible to hold them will find this Holdfast screw driver a handy article for the tool kit.

Pulling forward the bit will open the jaws so that the head of the screw may be grasped, while pulling back the bit will hold it fast.

The device is furnished in several sizes, while a special attachment for ratchet and spiral screwdrivers is also available.



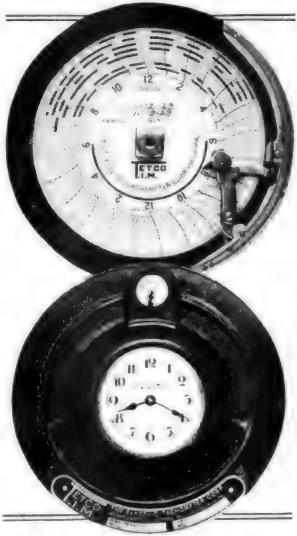
Center picture shows screw driver holding screw. At *left* it is open ready to grip screw. The drawing on the right shows how it may be used to pick up objects out of reach of hand.

# Automatic Device Charts Hours Plane Is in the Air

DESIGNED for use of trans-continental plane operators, this device gives an accurate seven day record showing exactly what hours the plane was in use and during which hours it was idle.

The device may be placed anywhere, not necessarily on the dash board. It contains a circular piece of paper acting as a chart. As soon as the plane is started an attachment automatically marks the chart at the correct hour, continuing until the plane makes a landing. The record is fully automatic and does not depend on any connections with the plane except the screws which fasten it to a solid support. A strong lock makes it impossible for anyone except the proper person to examine the record. Also, when a beginner is "getting in his hours" in his own machine the device provides an infallible and indisputable record from one week to the next.

Another model of the device is made for use on commercial cars and trucks, for various kinds of machinery such as printing presses, etc.




Front of device removed, showing chart and stylus. When weight of plane is removed from landing gear the stylus makes contact with chart.

## Septic Tank from Concrete Pipe

ONE of the banana companies in La Ceiba, Honduras, Central America uses regular 36-inch concrete pipe in two-foot sections for septic tanks. Two sections of this pipe are laid down for each tank.

A cover is cast out of concrete with a groove running around the lower side that exactly fits the exposed joint on the top section of pipe. This gives an air tight and vermin proof septic tank at little cost.

## Big Dealings on California Beach as Beauties Use Mammoth Cards

MAMMOTH playing cards suitable for outdoor use have recently become the fad with society beauties on the California beaches. The photo shows a poker game in progress with paper plates used as chips. The cards are waterproof and very durable, and while a trifle too large for convenience have proved popular with those seeking something new in the way of amusements. A lapful is dealt to each player instead of a hand.

# How Your Senses

The man with his back turned can't distinguish between the stroking hand and the stroking brush.

YOUR senses *do* fool you! Almost any doctor would tell almost any man that his five major senses were in perfect working order. Yet, take that same man and his five senses—seeing, hearing, smelling, tasting and feeling—and you will find that each of the senses, although usually pronounced perfectly sound, is subject to little quirks and twists that would seem to indicate that it is not the infallible indicator it is supposed to be.

Crossed fingers rotated on top of a marble register sensation of two marbles. At left is shown a cigarette test proving man's sense of taste is useless without aid of sense of smell.

Take, for example, the sense of touch. You are, no doubt, familiar with that little party stunt which usually goes under the label of "The Clothesbrush Stunt." In this demonstration,

# FOOL YOU by SAM BROWN

The girl feels two points of shears separated only an eighth of an inch at her finger tip but same points would feel like one on her shoulder.

Shears widely separated to register two pricks.

the performer takes a clothes brush and offers his services as valet to some spectator. The spectator offers himself, and the entertainer proceeds to "brush him off"; at least that is what the spectator is fondly imagining. Instead, the performer is smilingly brushing his own coat, while he strokes the back of the victim's coat with his free hand. The illusion is very deceptive and its complete success results from the fact that the average person's sense of feeling is comparatively undeveloped in the regions around the shoulders—far too undeveloped to detect the difference between the feel of a stroking hand or a stroking brush.

This variation of the sense of feeling is quite interesting; and its wide differences can be easily shown through a few simple tests. For the first, take a pair of sharp-pointed scissors and spread the points to a distance of about one-eighth inch. Now, press these two points of the scissors into the hand of an assistant on one of the fingertips. Ask him whether he feels one or two points, and, in the majority of cases, he will immediately answer, "two points." Take the same scissors, however, and press them into the shoulder of the assistant, and he will pronounce the two points, which are still separated one-eighth of an inch, as one point. Indeed, the sense of touch so greatly varies that it is usually necessary to separate the scissor points to a distance of almost two inches before two separate pricking sensations are experienced by the spectator.

## *Your Eyes Are Perhaps the Biggest "Jokers" of Your Five Senses*

Even though the fingertips are very sensitive, they are not infallible. This is easily demonstrated by crossing the first and second fingers of one hand, and placing the crossed tips lightly on top of a round marble, as shown in the photograph. The fingers are then rotated on top of the marble; and the sensation produced is that of two marbles being pressed under the fingers.

The other senses, too, are foolers. The sense of taste, especially, is wholly unreliable when not assisted by its companionate sense — the sense of smell.

Any inveterate cigarette smoker will tell you that he "tastes" the cigarette he smokes, and that one brand of cigarette tastes entirely different from another brand. Blindfold him and have him hold his nose. Place him in a room where the temperature is eighty or above. And then, have him take haphazard puffs on a lighted and an unlighted cigarette of different brands. In the course of two minutes he will not only be unable to distinguish between the smell of the tobacco in the two brands, but he will be unable to tell whether he is puffing on the lighted or unlighted cigarette. The explanation is simple: The sense of taste alone is really of no use unless aided by the other senses, particularly the sense of smell. In a similar manner, the average person cannot detect the difference between raw potato and raw apple unless his taste organs are assisted by the seeing and smelling senses.

**Hold magazine level with eyes as above and lines will appear as a stockade, standing on end. Look at diagram from side and you merely see lines lying flat.**

Your eyes, of course, are the biggest "jokers." Have you ever bought a suit or a dress, thinking it to be one color under the artificial light of the store, and then finding it to be something else in broad daylight?

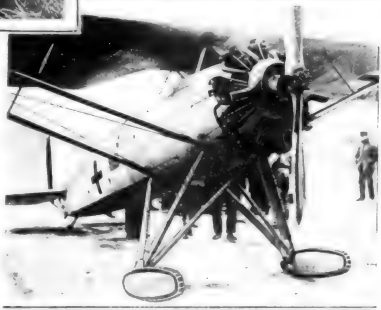
Almost all of the principles which govern these delusions in vision are being applied in the various arts—interior decorating, dressmaking, etc. One of the most familiar of these deceptions is that a vertical line appears longer than a horizontal line; and in actual practice this principle is used in the dressing of stout and very slender people in order to make them appear of an average size. An optical illusion which shows this principle is pictured in the diagram and photograph above. Hold this magazine almost on a level with your eyes and sight across the diagram, having it parallel with your eyes. What you see is something of a stockade, with the various lines standing on end as posts. Looking at the same diagram from the side, the lines appear to be merely lines, somewhat shorter, and lying flat. The same thing applies to suits and dresses with horizontal or vertical stripes. The horizontal stripe tends to make the wearer shorter and stouter than he really is; while the vertical stripe serves to apparently increase his height and render less conspicuous his "beam" dimensions.

# Safer Landings with Caterpillar Wheels

BORROWING the idea from the tanks and tractors which appear to be able to proceed over any ground no matter how rough, the French firm of airplane designers and builders, Gourdan-Leseurre, have constructed the first plane equipped with a caterpillar landing gear and have tested it out at the Villacoublay-Paris Airdrome with excellent results.

The caterpillar treads are mounted on a drum about the size of an ordinary landing wheel, the drums being streamlined to reduce parasite resistance. The undercarriage is mounted on the extreme rear end of the drum, permitting free movement of the caterpillar tread over rough ground. A specially designed shock absorber is built into drum, and is said to take up more of the shock than the old type employed with the conventional wheels.

**Above is shown the construction of the caterpillar landing wheel. Shock absorbers are incorporated in the drum. The photo at the right shows the unique appearance of a plane equipped with this gear.**



## Bee Not Hardest Worker

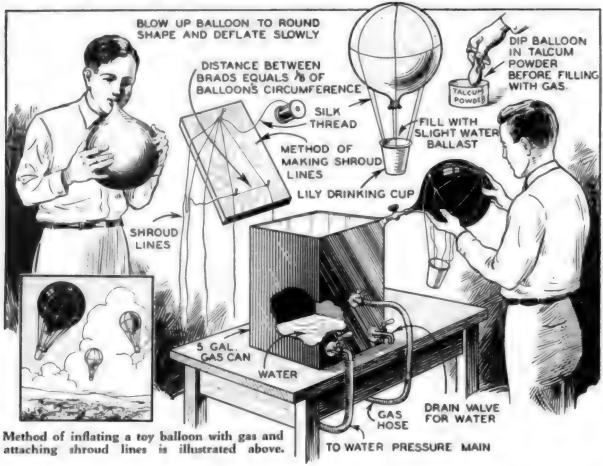
THAT the tiny midge, so small as to be almost invisible, works harder than the bee or any other insect in the useful service of pollenating blossoms has been discovered by scientists of the Royal Horticultural Society. Day after day these scientists watched and counted the number of bees, wasps, midges and other insects visiting the blossoms of fruit trees. The midges were found to be more numerous than even the bees, which are usually credited with most of the service of carrying pollen.

Wet or stormy weather keeps honey bees inside the hive, while most wasps and other insects stay home when it rains; one exception being the bumble bee, which is a hardy creature. The tiny midges, however, continue their flower visits regardless of weather, perhaps because these insects are small enough to fly around between the raindrops.

## Paper Kept Clean With Celluloid

WHEN the work keeps the hands dirty, books, report sheets, and other printed or written materials are kept clean by covering with thin celluloid. Gather this and keep a supply on hand. It is readily obtained from old photo negatives with the emulsion cleaned off, or the thicker stock from old touring car windows. When writing, lay one of these sheets on the paper where the hand rests. It will slide along and leave the paper clean.

# Inflating Toy Balloons With Gas From the City Mains




**Method of inflating a toy balloon with gas and attaching shroud lines is illustrated above.**

GAS from the city mains can be used to inflate toy balloons with the simple inflating device shown in the drawing above. Gas as it comes out of the ordinary jet has only a pressure of a couple of pounds behind it, which is quite insufficient for inflating purposes.

Secure an air-tight tin can and fit it with petcocks as indicated in the drawing. Exhaust the can of air by filling it with water, closing the top petcock to prevent air from rushing in when the drain is opened. Now turn on the gas and the water in the can will slowly trickle out, forced by the gas pressure. When the can is full of gas, attach the balloon to the top petcock and then turn on the water supply from the mains. The water will increase the gas pressure to 40 pounds. The water, therefore, must be turned on slowly so that the balloon will not burst from excess pressure.

To fix the shroud lines around the balloon, which are necessary to support the basket, take a board and fix two brads in it, spaced apart to a distance equal to one-sixth the circumference of the balloon when inflated. Blow the balloon up gently with your lips until it is rounded out to the desired size. A third brad is driven into the board above the other two, and this distance equals half the circumference of the balloon. The bottoms of the shroud lines are left long for attaching to the basket.

A paper drinking cup is used for the basket. When the balloon is inflated and its neck tied with silk thread to prevent the gas escaping, fill the basket with half an inch of water and take out a teaspoonful at a time until the balloon rises. When cast loose it will stay low enough in the air so you can observe it for a long time. Before filling with gas, it is best to dip the balloon in talcum powder to prevent scratches from pricking the rubber and puncturing it.

In inflating the balloon, the neck is attached to the petcock through the shroud lines, as illustrated in the drawing. Be sure that the shroud lines are hung evenly so that the lily cup basket is directly under the center of the balloon. This insures an even, steady ascent.

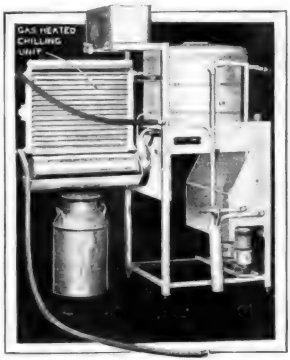
# Heat That Freezes Chills Milk and Kills Bacteria

HEAT is playing an increasingly important role in the providing of pure milk supplies. Pasteurization now is almost a universal practice in the milk plants that supply the city dweller, and this requires the application of a high degree of heat. Prior to this pasteurization, the most essential thing is the chilling of the milk immediately after it has been drawn from the cow, in order to check the rapid growth of destructive bacteria. This, too, can now be most effectively done by the application of heat.

Heat that freezes! This is the principle of a new type of milk chiller. It has been applied to a device for the cooling of milk by the manufacturer of an oil-burning household refrigerator recently brought out for use in rural homes where central station electricity is not available.

As in the household refrigerator, the oil-burning milk chiller employs the absorption type of refrigeration. The refrigerant which is hermetically sealed inside the device is activated by the heat from kerosene burners somewhat like those used on oil cook stoves. However, instead of cooling a cabinet used for food storage, the evaporator of the milk-cooling device is in the form of a chilling cylinder, over which the milk flows and is chilled before it is put into the shipping cans.

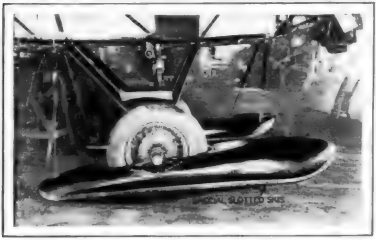
Slightly more than a quart of kerosene is required for the burners to generate sufficient refrigeration to cool from 20 to 30 gallons of milk. The capacity is dependent upon the temperature of the circulating water which is permitted to flow through the condenser tank of the refrigerating device during the heating period and through the aerator of the cooling device during the time the milk is being cooled.




**The milk, emptied into the tank on top, flows over the aerator and around chilling cylinder.**

The burners consume the quart of kerosene in about an hour and three quarters and when refrigeration has been completely generated, the burners automatically go out.

## Transcontinental Air Mail Planes Adopt All-Weather Landing Gear

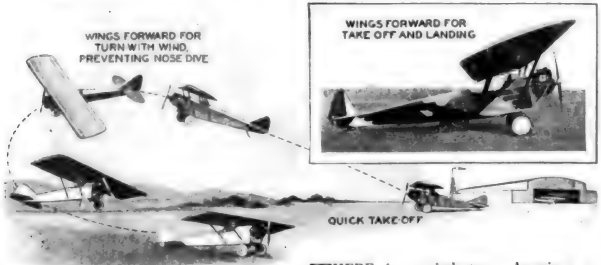


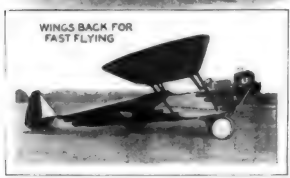

**These skis require no change in undercarriage structure.**

DEEP snows will no longer hold terrors for trans-continental air mail pilots between Chicago and San Francisco, for the Boeing system has recently perfected and installed the first snowphibion.

Special slotted skis, said to be an innovation for heavy duty aircraft, are sufficiently strong to withstand the shock of landing of mail planes weighing three tons. Even tri-motored transport planes weighing nearly four tons fully loaded have been successfully landed with these skis.

# NOVEL IDEAS Keep Pace



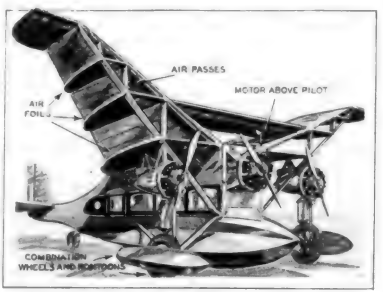




**A plane that provides quick take-off at low speed, gains altitude in a short run and lands with the wind without tail spinning or nose diving has recently been tested by Gerald Henney, the inventor. The wings move backward for fast flying and can be pushed ahead for take-off and landing. How the idea works is illustrated above. Spins are impossible.**

THERE is no industry — American or foreign—that is receiving as much attention from creative minds today as aviation. That is amply demonstrated by the remarkable number of new ideas that daily find their way into the patent or copyright divisions at Washington.

And the list of the things that inventors feel the industry requires is almost unending. From new-fangled ways of bolting a spar to complete designs and models of planes, everything is included. There is a constant parade of things new and novel to flying. True, much of it is "chaff" but from it all has dropped much "wheat" that has grown into important factors in the field. The Guggenheim search for the fool-proof plane is but one example. Others are contained in the pictures that illustrate

**To the right we have a ship still in the idea stage. It is the work of Jay Gould Shrum who states that in this plane are combined all the features of safety, stability, endurance and speed. Equipped with both wheels and pontoons it is planned for land or water use. The controls are so arranged that the ship cannot be nosed down at a dangerous angle or banked too far. The plane can only go straight ahead and "parachutes" to a landing. It is perfectly fool-proof, according to the inventor, as there is no fabric on the bridgework to offer resistance. This idea is a radical departure from all accepted aerodynamical principles. Parasite resistance appears to be enormous, while the wing area appears rather low.**



# with AVIATION'S ADVANCE

**What is considered to be one of the most important contributions to flying safety is the device perfected by Dr. C. H. Vance. It consists of two sets of auxiliary control surfaces which keep the plane at a set altitude and on even keel.**

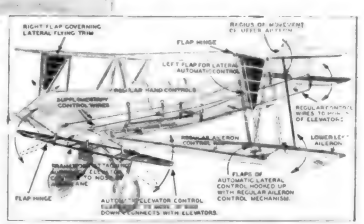
**The automatic elevator controls are attached to the fuselage and set in front of the lower wings. They are operated from the cockpit. Once adjusted, they maintain the plane at a constant angle of attack. This enables the pilot to fly blind without constant checking of inclinometers and altimeters.**

these two pages. They—in practically all cases—are ideas from fellows outside the pall whose only contact with the field is a sincere interest to add their bit of knowledge to an industry that requires the help of many to raise it to perfection.

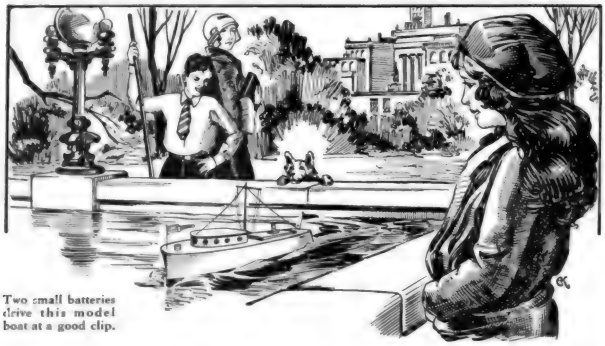
The tendency seems to be toward increasing the factor of safety. In

**Fritz Secor, western pilot and stunt flyer, joined Dr. Vance in testing the latter's device by stunting about on the wings and fuselage while the ship flew under its own control. Holding his hands above his head as he took off, the ship rose and flew on even keel when 2000 feet up. It maintained its course while Secor balanced himself on various parts of the plane. When he got through, Secor let the ship land itself.**

the three ideas shown here that thought has been dominant. Vance, Shrum and Hennesy have each tried to overcome some of the hazards of air travel and in a measure seem to have succeeded if tests and models are any criterion at all. In the Eaglerock that Vance equipped with two sets of auxiliary control surfaces, Fritz Secor, veteran stunt pilot, flew about without a hand on the control and finally left the cockpit altogether and climbed about the wings and fuselage to show that the ship could fly and regulate itself alone.




**A better idea of how the Vance idea works can be gathered from the diagram above. The simplicity of control is particularly noteworthy.**



Two small batteries drive this model boat at a good clip.

# Model Cruiser run by FLASHLIGHT Batteries

*by* **HI SIBLEY**

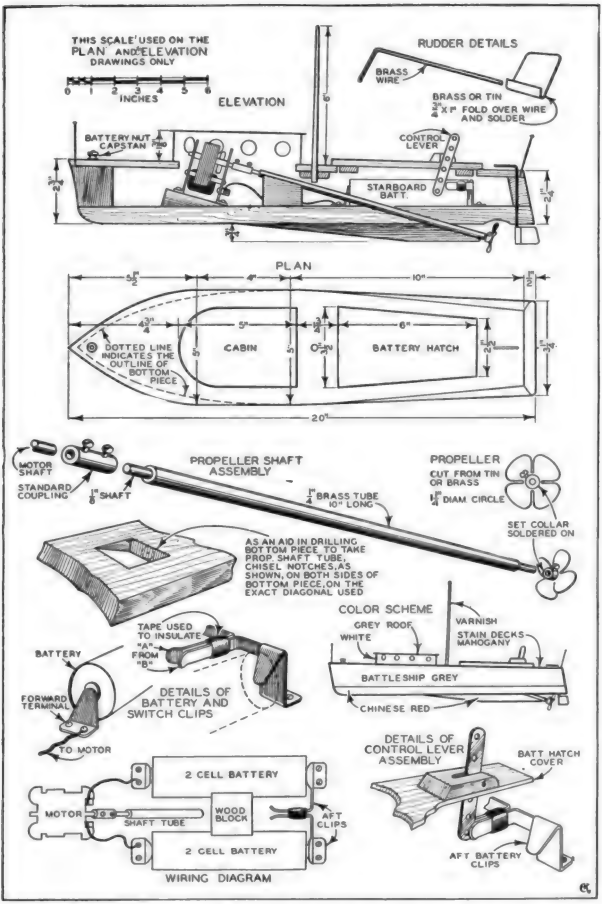
DEVELOPMENT of the flashlight battery has resulted in remarkable energy in a small container, and it is now possible to propel model boats from this source of power. The *Electra* illustrated here is a very satisfactory cruiser, easily made by using a small standard motor retailing at $1.25, and parts of toy construction sets.

In experimenting with this type of power two boats were made, the first with a "dug-out" hull—i. e., one hollowed out and shaped from a single block. It was rather a laborious job; the hull was heavy and cumbersome and had a tendency to crack.

A great improvement was noted in the second hull, which was built up from separate bottom and deck pieces and having tough pasteboard sides or planking. This idea was so successful, in fact, that this writer expects to use it in many other types of craft of over a foot in length.

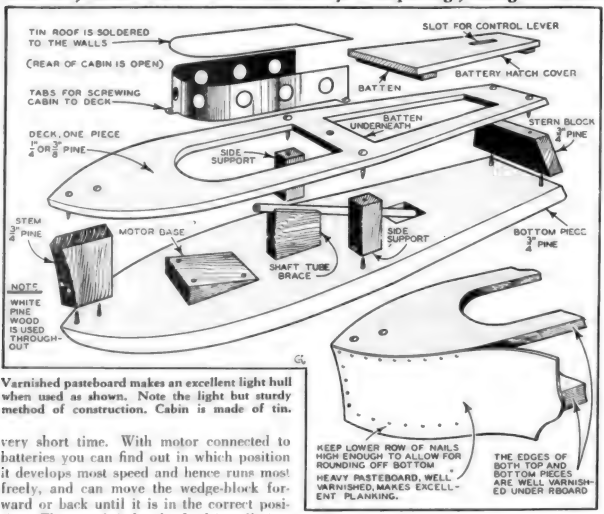
There appears to be no more satisfactory wood for small boats than white pine, and if available, by all means use it throughout when making a copy of the *Electra*. Begin with the bottom piece, the outlines of which are shown in the plan. Use ¾-inch clear material, and when you have shaped it close to its finished outline, make a temporary installation of the motor by setting it on a wedge-shaped block or base and determining where to bore the hole for the propeller shaft tube. It is not easy to bore a hole on a shallow angle like this without first cutting a notch in the wood. This can be done with a chisel or gouge, and when the tip of the bit starts through on the other side, chisel out a notch there also, so the wood will not split and sliver.

Insert the propeller-shaft tube, place your motor on the base and with a construction-set brass coupling, connect up the propeller shaft and test out the motor to see if it is in line. *Your propeller-shaft must be in line with the armature-shaft*, for if not it will bind and run down your batteries in a




**Details of hull construction and installation of the battery power plant are shown in drawing above.**

## *Twin Dry Cells Will Drive Model Boat for Surprisingly Long Distances*




**Varnished pasteboard makes an excellent light hull when used as shown. Note the light but sturdy method of construction. Cabin is made of tin.**

very short time. With motor connected to batteries you can find out in which position it develops most speed and hence runs most freely, and can move the wedge-block forward or back until it is in the correct position. Then mark it for the final installation. It may be necessary to shim up one leg of the motor with a piece of cardboard to improve the alignment. However, this is the most important item in making the entire boat, so you may as well do it properly at the outset. A wood block under the propeller-shaft tube will keep it in alignment, and should be set before building up the hull.

Battery installation comes next. The dry cells used in the original model cost 10 cents per set of two cells, the tube measuring 1¼ in. diameter by 4⅝ in. long. These batteries will drive a well-aligned boat for a surprisingly long time, but will not stand any undue load. However, they do not cost a great deal and the *Electra's* battery room is designed so that new cells can easily be substituted.

The tin or sheet copper terminals, as shown in sketch, serve both as contacts and brackets to hold the batteries in place. They are simply made from pieces of a tobacco tin. If a lithographed tin is used, sandpaper the surface clean so there will be a good contact.

Control is accomplished by means of a bar set in a slot in the battery-hatch cover. When this is moved forward it makes a contact between the two rear terminals, as shown in drawing. These terminals are insulated from one another by a piece of tire-tape wound around one of them.

Cut out the deck piece with a coping saw, and attach with a cross-batten on the underside, between the opening for the cabin and the battery hatch.

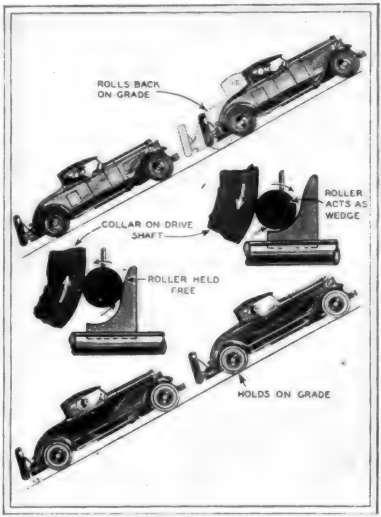
The motor, of course, is removed while building up the hull, but the propeller-shaft tube should be left in place. Stem, stern-block and side supports are made of ¾-inch white pine in the shapes illustrated. They do not need to be whittled down to finished size until the hull framework is put together.

*(Continued on page 196)*

# Simple Device Prevents Car From Rolling Back on Hill

ONE of the principal causes of smashed headlights, dented fenders and locked bumpers—the backing of a car on a grade in traffic before the clutch takes hold — may be eliminated by the device pictured on the right.

A collar attached to the transmission shaft holds a roller in the disengaged position when the car is in forward motion or at rest; however, the instant the car begins to roll back the collar revolves in the reverse direction, causing the roller to drop to the bottom of the groove where it becomes wedged, preventing further backward motion. When the transmission is placed in reverse, the roller is disengaged, permitting the car to be backed.

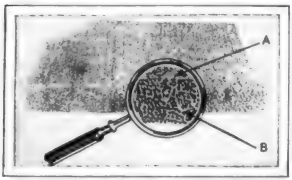



As the car rolls back roller slides down and locks collar.

## Rubber Mat Catches Gold

A CALIFORNIA inventor has perfected a cellular rubber substance which catches and holds a concentrate richer than has ever been known, in many cases extracting mineral values of 98 per cent without the aid of power.

During the dry season when rivers and creeks run low or completely dry up, the Indians of California scrape up all of the available moss from rock, boulders and roots of trees over which water passed when the streams were at a higher level. This moss they collect and dry in the sun, after which it is burned and the ashes "panned" in their hand-made utensils. From this moss ash an unbelievable amount of the finest free gold is obtained by this primitive method of concentration.




"A" shows surface containing cells which catch and hold the gold. "B" is a profile view showing cellular construction of rubber mat.

This crude method with its simplicity and astounding capacity for catching and holding fine particles of gold gave rise to the idea of commercializing this natural method. Frank S. Morgan, a Berkeley metallurgist, conceived the idea of a cellular rubber substance in the form of a mat, the surface of which contains myriads of small openings.

Experiments have proved that gold-bearing ore in the form of pulp or sands, passed with water on a suitable grade over the surface of the rubber mat, caused the particles of gold to be held in the cavities of the mat while the ore and water passed over. Gold is removed from the mat by burning away the rubber.

# Self Launching Emergency Ship Section Cannot Sink

Boat may be launched from either side of ship.

A LIFE saving device that automatically releases itself when the ship sinks, or may be launched from either side of the ship at will, has been invented by Captain C. F. Rodin, of San Francisco, a former ship master.

The device consists of an emergency section, large enough to carry all persons on board, which rests crosswise on the deck on a special runway. In case of disaster, the section is released after all are on board by merely pressing a lever, or it will float when the deck becomes submerged. Water and food are always in the section.

## Live Rubber Protector for Table

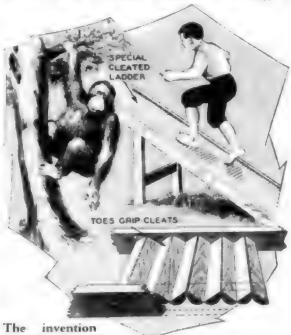
PROTEXIT is the name of an article recently placed on the market which permits the food chopper, juice extractor, can opener, or other device with metal clamps to be firmly fastened to the table without marring the finish. The protector is moulded from live rubber so as to fit any ordinary table, and is corrugated to prevent slipping.

## Vacuum Cleaner for Garage Use

KEEPING the floor and upholstery of the family car clean has long been a problem. The ordinary vacuum cleaner is much too large to get at the corners of the seats, while a brush is utterly inadequate. This cleaner fills the bill nicely.

## Cleated Ladder Strengthens Feet

A SPECIAL ladder for strengthening ankles and toes has been found successful in German schools. Children are required to walk up and down this ladder barefooted, their toes gripping the cleats. While there is small danger of falling, it is impossible to walk over this ladder without exercising muscles in the feet, ankles and toes which are never used in ordinary walking on flat surfaces with shoe-clad feet.




The invention imitates monkey life, bringing into play muscles seldom used.

# Movie Camera Photographs the Strata Structure of Earth

SOME means of obtaining an accurate and incontestable idea as to the nature of the strata structure of the earth in which they work has long been a pressing necessity among oil men. A highly efficient method of determining the quality and position of the strata has been found in the use of the "underground eye," a small movie camera which slides down the well casing and makes a photo of the material, thus giving first hand information.

The camera, shown in the diagram at the right, is fitted into a protective bronze casing. The whole contrivance is inserted into the well casing and lowered by a rope to the opening in the outer casing where photo is to be made. When the operator pulls the cord connected with the shutter, the "underground eye" registers a photo of the strata.

## Chain Vise to Clamp Packing Ring

STIFF, heavy packing rings are often hard to get down into a cylinder counterbore as the piston is forced in. The photo at the left shows how a piece of common safety chain can be used for the purpose. The tang of a file is stuck through one of the links so that the point enters the end or last link at the angle as shown. Using the file as a small lever the chain easily compresses the ring while it goes down into the counterbore.

## Toaster Serves Many Needs

ELECTRIC toasters can be used for many other purposes besides toasting. At night a flat top toaster makes an excellent milk or hot water heater, and many a pot can be kept simmering or even boiling, by bringing it up to boil on the gas, then transferring it to the toaster. As a means of keeping a glue pot hot it cannot be excelled.

When the heating element of a toaster breaks near the end, repairs can be made by eliminating the broken end and stretching the remaining portion to reach the contact screw where the end should be fastened.

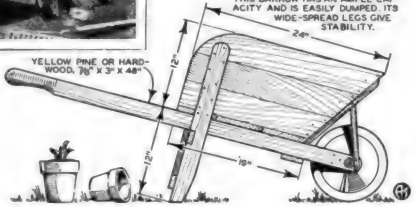
**The "electric eye," a small movie camera protected by a bronze casing, shown in the diagram above, is inserted into the well casing and lowered to the desired depth, where a photo of the strata material is snapped, the shutter being operated by a cord. The camera cannot lie, and an accurate picture of the strata structure is obtained.**

# A Simply

*by* HI SIBLEY

**Simplicity and durability are features which recommend this easily built barrow which will be a vehicle of all work around the home.**

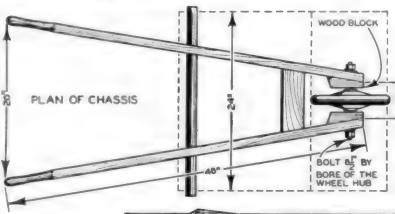
**Although it is substantial enough to last for years, the wheelbarrow is not too heavy to be handled by a youngster.**

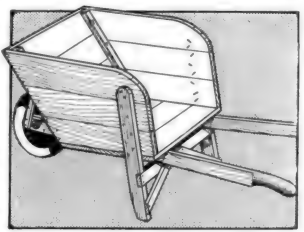



CONFRONTED with the task of moving a pile of rubbish to make room for some young plants before they withered, the writer set to work the evening before and built this handy garden barrow from odds and ends picked up in the back yard.

It has since proved indispensable in carting lawn clippings, leaves, fertilizer and top soil, and has paid for the labor many times over in gathering firewood from new houses being built in the vicinity.

If one has an old wheel from a child's coaster, half the job is done. The wheel, however, should be at least 10 inches in diameter. The rest is simply a matter of old boards, screws or nails, a long bolt, hammer, saw and brace and bit. Roller bearings in the coaster wheel make it very easy running, and with the rubber tire, quiet on sidewalk and pavement. In case no ready-made wheel is available, one can be built up from wood as in the diagram. Make the latter at least 12 inches in diameter. Care should be taken to bore the hole true so the wheel will not wobble.



**Dimensions and layout of the garden barrow.**

# Made Garden Barrow

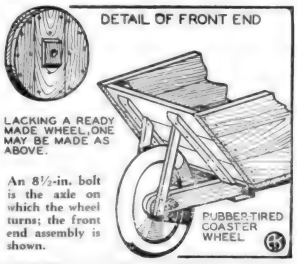
First cut the frame, or handle pieces. Yellow pine will do if you have no stronger hardwood. Lay these out at the required angle and fasten on the rear cross bar which also serves as a leg brace, and a shorter piece near the wheel, clearing the tire by about half an inch. If you have a breast drill to bore guide holes, it is well to use screws wherever possible, so that the frame will not work loose under load. This applies to the body, also.

As this barrow will serve you many years, you may as well do the work neatly; it takes no more time in the end. Cut a pair of blocks from 2x4's to attach to the main frame pieces on either side of the wheel hub. These should permit just enough clearance for free running after washers are installed on each side of the hub. Bore the hole for the axle-bolt for a tight fit, and be sure to get it in line. The size of the axle bolt depends, of course, on the diameter of the bore in whatever wheel is used.

Before installing the wheel, build up the body as shown, together with the braces at the front end and for the legs. Use screws, if convenient. If not, nails should be long enough to drive through and clinched, otherwise they may pull out.

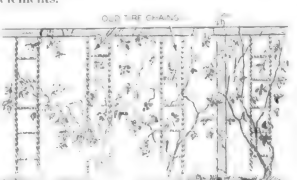
Assuming you have made a workmanlike job, two coats of paint will greatly add to its appearance, so that it will be an ornament rather than an eyesore. The original of this model was painted a dark brown inside the box, with a rich green on the outside and frame work. The handles were varnished in natural wood, and the wheel finished in bright red. Any appropriate color scheme, however, will serve just as well. If you want to go to a little more work, a sheet metal covering can be added to the interior of the barrow, using light weight galvanized iron or similar material, mounted in place with flat-headed tacks or small screws.

When completed you will have something to be proud of, and you will be surprised at the number of jobs this trim barrow is called on to handle. It is quite strong, and yet so light that the children can push it loaded without strain. You will note that most of the load is carried well over the wheel.




## Tire Chains Make Good Trellis for Garden Arbor

ALMOST every home in which there is a motorist will have some discarded automobile tire chains in the garage which are of no further use on the car by reason of broken links or general decrepitude. Such chains can be used to advantage in the home garden by suspending them from a horizontal frame, as illustrated in the drawing below, where they will serve as ladders on which grape vines or other climbing plants may grow. The weight of the chain is sufficient to prevent it from swaying in the breeze, but if desired the lower ends can be anchored to the ground if the crossbar at the top is of just the right height. If the tire chains are of a cheap make which will rust easily, a coat of paint of some harmonious shade will preserve them from the elements.




**An excellent trellis for the garden can be made by suspending auto tire chains from a crosspiece.**

## *Andy Discourses on a Variety of Topics to Interest Shop Mail Box Fans*

*(Continued from page 32)*

**Meet B. H. Pietenpol, the man who put the Ford Model A engine on a real flying basis.**

AND speaking of the *Pietenpol Camper*, I am reminded of my promise of last month to introduce you to one of the best designers of lightplanes in America. He is B. H. Pietenpol, and his likeness is off to the left here. I have told you in the beginning of this column what Piet's work is like. You'll see more of her in the fall edition of the FLYING MANUAL. Pietenpol has built five of these ships and has the bugs taken out so completely that they fly themselves. I had a ride in one of these wagons and never had so much fun in my life since I used to be in school experimenting with high tension current effects on the seat of the physics teacher's pants. Piet's *Air Camper* is a real job for cross country work, because you simply can't kill that engine!

**Here is how one of the standardized Pietenpol Air Campers looks. She's small, reliable, quite fast, and will carry a surprising load with ease.**

* * *

DICK GRACE, who wrote the yarn on Movie Plane Crashes which is the subject for our cover tie up this month, is as brilliant a writer as he is a flyer. Every word is Dick's—there isn't a comma edited. Seldom do we get a yarn so replete with the spirit of old time aviation—the spirit which knows its chances and hazards, but which is confident when all considerations have been thought out.

Things that interested this ink-slinging grease monk in the June issue: Ed Heath's new type cowling for the Parasol which allows it to run for hours and hours wide open with no coddling of the motor; Jim Church's high performance mid-wing ship; Little Forces that Help Run the World—this picture page gripped my imagination; ever figure on playing Robinson Crusoe? The steel oil barrel A. H. Lyons used for a radiator in crossing the continent in his car when two regular radiators petered out; that new Capitol Stern Drive for Ford motors in boats; and, of course, the Paris Gun, than which story there has been none whicher!

* * *

Incidentally, Radio Editor Robbins' yarn on the Pygmy transmitter this issue is a good one. Stuff like that, that you can make from the out of the ordinary parts, like clock gears, and so on, is always absorbing stuff for those of us who are dotty about radio.

* * *

This hombre, Dick Cole, MODERN MECHANICS' own snow white lulu of a how to build originator has the yarn in this issue we promised in this columbo last month. It's on page 145—see what it's like! How'd you like to run to Pike's Peak in that buggy? We claim this is a sample of what MODERN MECHANICS has become famous for—originality. Come again, Dick.

* * *

Hi Sibley, who lives in California and has a sunny disposition therefore, is doing us a yarn that ranks with Dick Cole's for originality. It is on a model airplane that really flies with a pint sized gas engine. We may not get it into the magazine in time for the early fall issues, but you can bet your tubes out of last year's radio set that it'll be in the new flying handbook. This'll be on the stands about September or October.

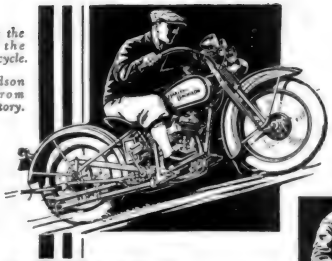
* * *

Hi Sibley's name is synonymous, says me, with the greatest variety in real, adequate, grown up how to build articles. We're proud of you, Sib.

*(Continued on page 203)*

*Shown here is the "45 Twin" — the ideal solo motorcycle.*

*Harley-Davidson prices range from $260 f. o. b. factory.*



# THE THRILL OF THRILLS

## —any way you look at it!

MOTORCYCLING — the thrills of a dozen sports in one! A mount that responds instantly to every whim — now streaking down the highway — now zooming over a towering hill — now just purring along a winding by-road. A mount to be proud and fond of—not just transportation.

Answer the call of the Open Road with your own Harley-Davidson. What a glorious way to start the Summer! What a vacation you'll have *this* year! And the trips, the tours, and the week-end outings with the jolly Harley-Davidson bunch! Cost? So little you'll scarcely notice it — for a Harley-Davidson is easy to buy, and costs only a penny or two per mile.

Let your nearest Harley-Davidson Dealer demonstrate the wonderful "45 Twin" shown here, and the other 1930 models. Ask about his Pay-As-You-Ride Plan.

## Ride a HARLEY-DAVIDSON

CLIP THE COUPON

HARLEY-DAVIDSON MOTOR COMPANY
Dept. MM, Milwaukee, Wis.
Interested in your motorcycles. Send literature.

Name.....

Address.....

My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years. Check your age group.

*"Give me 7 days and I'll prove that you can build a healthy, husky body like mine"*—CHARLES ATLAS

YOU, TOO, can win my kind of muscle-power—get new health, strength and energy—acquire a new, more forceful personality! I'll reveal to you my secret of **Dynamic-Tension** that made me over and won me my title, **"The World's Most Perfectly Developed Man."** I'll give you the PROOF—in your first 7 days under my direction—that YOU can be this NEW MAN!

No part of your body is slighted by my system because it's made to fit your individual needs. My methods dig down to the root source of your troubles and quickly banish such irritating ailments as constipation, blotchy or pimply skin, frequent colds, various nervous disorders, etc. And all I ask is 15 minutes a day of your spare time, right in your own home, following my simple instructions—without apparatus, special foods, pills, "rays" or any other unnatural means.

If you are not 100% PROUD of your body, send for a free copy of my 48-page book **"Everlasting Health and Strength."** Then read all about my methods, look at the fine pictures of myself and the scores of others who have used my methods so successfully. Invest just a 2c stamp to mail the coupon below—to win the biggest prize on earth—a handsome, healthy, HUSKY body! Send to CHARLES ATLAS, 171 Madison Avenue, (Dept. 67) New York, N. Y.

**CHARLES ATLAS (Dept. 67)**
**171 Madison Ave., New York City**

I want the proof that your system of **Dynamic Tension** will give me, too, a healthy, husky body and big muscle development. Send me your free book, **"Everlasting Health and Strength"** and a confidential chart for my measurements.

Name .....
(Please Print or Write Plainly)

Address .....

City & State .....

## Crashing Planes for the Movies

*(Continued from page 49)*

The clothes which I wore were regulation Bedford cords, the usual leather coat, golf sox and ordinary shoes. Boots are too awkward to remove in case of leg injury. The helmet was of hard leather and the goggles the same type generally found in use today.

I have been asked many times why I don't pad myself; why I don't use a steel jacket or other protection. If I were looking for protection I probably would never have started crashing airplanes. Another and more reasonable explanation for such action is that if I follow my mathematical calculations to a logical conclusion, only the parts of the ship will go that I desire. Sometimes it is necessary to cut struts or to strengthen them to get the desired effect and to produce the proper dissipation of forces. If I missed, no matter what form of padding or armor I wore it would be no more protection than paper. In one of my crashes a splinter of wood pierced a steel longeron, after having passed between the belt and sleeve of my leather coat. What use then of armor? It is better to try to keep wreckage from puncturing a vital part of my body. It only takes a gash an inch and a half in the back, and then, of course, I'll fly over to the Other Side. Until that time I can still say I've solved crashes.

I fastened the belt around my knees and the extra one around my chest. The latter is an invention of Harry Reynolds' and mine. After I broke my neck on "Wings" we decided that a device ought to be made to eliminate the snap of the neck. So the chest belt. At first we built it as strong as possible, but after I had injured several ribs from the mere pressure of my chest against the six-inch webbing, we decided that it had to give just before it crushed me. We approximated the pressure necessary to break these bones at 600 pounds, providing that the speed was about ninety miles per hour. Therefore belts now give at that point.

We also found after several more crashes that even the chest and lap belts were insufficient. If I landed on my back with great force there was a tendency for me to dive out. I never quite made the final getaway, but I have bumped my head. So we put shoulder straps on the chest belt and now

by Dick Grace

think that that minor detail is completely solved.

I looked at my watch. In just seven minutes I was due. Soon as the motor was turned over and revved up it would be time for the take-off.

I adjusted the goggles and found the point on the strap which was easiest to grasp when I wanted to throw them away. Everyone knows that it would be foolish to crash with goggles on the eyes. Just a splinter of glass or a sudden gouge on the sharp steel rim and the crash pilot might never see again.

The prop was revolving slowly, my goggles were in place, the blocks removed. I was down the runway with full gun on. The ship became lighter on its wheels. It left the ground—its last take-off. The motor was humming, the wires singing. Now the ship and I were one. It assumed part of my personality and I became an integral part of it. Together we had a mission to perform; a mission of mechanics and mathematics which should destroy it and leave me unscathed.

As I gained altitude I noticed that the wind was favorable. It was blowing five miles an hour, in a direction which would almost head us into it for the crash. Conditions seemed ideal.

In five minutes I had sufficient altitude to skim the mountains and with full gun on pulled over the cliffs and dropped to the gully-like bowl below. The stunt was on. I couldn't have changed my mind if I had wanted to, and no one was more anxious to see me start into that grinding, rending spill than I was.

Those on the ground were excited. Yet under the circumstances they maintained exceptional self-control. I could see the police, fire and rescue crews standing by. I glimpsed Reynolds and Director William Wellman by the pulmotor.

But as I nosed down I paid little attention to them. I had to hit the spot, to miss cameramen and to vindicate myself by getting the effect the company wanted for the picture.

I felt a change in the air. From the smooth, undisturbed currents I had encountered above the rim of the pocket, the air became a swirling, bumpy, unsupporting mass of atmosphere. I had to have full motor to keep altitude.

*(Continued on page 186)*

# "How we saved our first $500"

"Many and I had been married four years, but we couldn't save a cent. Fact is, we were constantly in debt and I was always worried for fear I would lose my position.

"Then one night I saw that something must be done, so I told Mary I was going to take a course with the International Correspondence Schools. 'I've been hoping you would do that,' she said. 'I know you can earn more money if you really try.'

"So I started studying after supper at night, in the spare time that used to go to waste. It wasn't hard and pretty soon I began to see it was helping me in my work. In three months a new position was open and the Boss gave me a chance at it because he'd heard I was studying with the I. C. S.

"Well, that was the start. Before the end of the year I received another raise and we began to save. We've got $500 in the bank now and we're going to have a lot more soon."

For thirty-five years the International Correspondence Schools have been helping men to win promotion, to earn more money, to get ahead in business and in life. You can do it too.

At least, find out how by marking and mailing the coupon printed below. It doesn't cost you a penny or obligate you in any way to do this, but it may be the means of changing your entire life. **Do it now.**

***Mail This Coupon for Free Booklet***

**INTERNATIONAL CORRESPONDENCE SCHOOLS**
*"The Universal University"*
**Box 2317-F, Scranton, Penna.**

Without cost or obligation, please send me a copy of your booklet, **"Who Wins and Why,"** and full particulars about the subject *before* which I have marked X:

**TECHNICAL AND INDUSTRIAL COURSES**

| | |
|---|---|
| ☐ Architect | ☐ Automobile Mechanic |
| ☐ Architectural Draftsman | ☐ Plumbing ☐ Steam Fitting |
| ☐ Building Estimating | ☐ Heating ☐ Ventilation |
| ☐ Wood Millworking | ☐ Sheet Metal Worker |
| ☐ Contractor and Builder | ☐ Steam Engineer |
| ☐ Structural Draftsman | ☐ Steam Electric Engineer |
| ☐ Structural Engineer | ☐ Civil Engineer |
| ☐ Electric Wiring | ☐ Surveying and Mapping |
| ☐ Electrical Engineer | ☐ Refrigeration ☐ Highway Engineer |
| ☐ Electric Lighting | ☐ R. R. Locomotives |
| ☐ Welding, Electric and Gas | ☐ R. R. Section Foreman |
| ☐ Reading Shop Blueprints | ☐ R. R. Bridge and Building Foreman |
| ☐ Telegraph Engineer | ☐ Air Brakes ☐ Train Operation |
| ☐ Telephone Work | ☐ Highway Engineering |
| ☐ Mechanical Engineer | ☐ Chemistry ☐ Pharmacy |
| ☐ Mechanical Draftsman | ☐ Coal Mining Engineer |
| ☐ Machinist ☐ Toolmaker | ☐ Navigation ☐ Boilermaker |
| ☐ Patternmaker | ☐ Textile Overseer or Supt. |
| ☐ Pipefitter ☐ Tinsmith | ☐ Cotton Manufacturing |
| ☐ Bridge Engineer | ☐ Woolen Manufacturing |
| ☐ Bridge and Building Foreman | ☐ Agriculture ☐ Fruit Growing |
| ☐ Gas Engines ☐ Diesel Engines | ☐ Poultry Farming ☐ Radio |
| ☐ Aviation Engines | ☐ Marine Engineer |

**BUSINESS TRAINING COURSES**

| | |
|---|---|
| ☐ Business Management | ☐ Business Correspondence |
| ☐ Office Management | ☐ Lettering, Show Cards ☐ Sign Lettering |
| ☐ Industrial Management | ☐ Stenography and Typing |
| ☐ Personnel Management | ☐ Complete Commercial |
| ☐ Traffic Management | ☐ Civil Service ☐ Mail Carrier |
| ☐ Accountancy ☐ Cost Accountant | ☐ Railway Mail Clerk |
| ☐ C. P. A. Accountant | ☐ Grade School Subjects |
| ☐ Bookkeeping | ☐ High School Subjects |
| ☐ Secretarial Work | ☐ College Preparatory |
| ☐ Spanish ☐ French | ☐ Illustrating ☐ Cartooning |
| ☐ Salesmanship ☐ Advertising | ☐ Lumber Dealer |

Name .....

Address .....

City ..... State .....

Occupation .....

*If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada*

You'll be Fascinated

by Dolores Del Rio's own story of her life, published for the first time anywhere and offered exclusively—

In the JULY issue

Screen Play secrets

On Sale Everywhere June 10

More about Greta Garbo; First Love Affairs of the Stars, Their Pet Charities; personality stories about Rita La Roy, Betty Compson, Lawrence Grey, Constance Bennett and many others; So This Is Hollywood; reviews of late films; last minute Hollywood news and a host of other exclusive features that makes this the most popular fan magazine

▼▼

*If your newsdealer is sold out, send 25c to Screen Play Secrets Magazine, Fawcett Publications, Inc., Minneapolis, Minn., and a copy of the July issue will be mailed you at once.*

## Crashing Planes for the Movies

*(Continued from page 185)*

Then came an unexpected bad break. As I made a vertical bank to come directly into the crash the wind switched from a breeze on my nose to a brisk 15-mile current on my tail.

That meant I could not crash at less than a hundred. I could not climb out. It had to be done. It was a rotten break of luck.

A few hundred feet ahead of me and down I glimpsed the spot. The troupe, the cameras, the onlookers might as well not have been there. I was oblivious to everything but the one spot. The finger of my air speed indicator wavered unsteadily around 105. It was going to be one of the fastest crashes I had ever attempted. Only twice before had I exceeded this speed. The one at 110 broke my neck; the one at 135 hurled me 40 feet from the ship.

At such times there are but two things to guard against; over-confidence, which makes the pilot inclined to be careless about details; and a lack of confidence, which robs his brain of the power to act decisively at the right moment. I have never been overconfident, but as I enter the last rushed moments of a crash I have supreme belief in my ability to walk out. Ships must go where I say and when I say; I could not let this be an exception.

When 500 feet away I ripped the goggles off. Then, leaning over the side of the cockpit, with the left hand on the stick and the right handling the throttle and switch, I got the last glimpse.

The ground was passing so fast that I could distinguish nothing. Even the spot was but a blurred outline in advance. The moment came. One short fraction of a second would carry me yards beyond the mark, into those cameras, the men—into tragedy.

Pushing the throttle full on I jabbed the stick entirely over to the right, dipping the wing. Just before I hit I kicked the rudder to the left, sliding the wing in first, thus keeping the motor from hitting directly on its nose.

The right wings hit and were torn from the fuselage. As the ship pivoted the propeller bit into the ground. The motor went into the main tank. Then I cut the switch. I saw the wheels tear through the lower wing toward the cockpit as the fuselage crumpled

*(Continued on page 188)*

# Build Your Own Plane!

YOU will find all the plans you need in the 1930 issue of **Modern Mechanics' Flying Manual.** In it are authoritative articles by such outstanding pilots and aircraft designers as Major H. H. Arnold, Ivan S. Driggs, Weston Farmer, Douglas Rolfe, Howard Wagle, Orville Hickman, C. M. Adams, Gene Shank, J. M. Allison, Stewart Rouse, Ed Heath and many others. They tell you the how, why, when and where of building your own little cloud-chaser.

Here are but a few of the subjects covered in the 1930 Flying Manual—Why an airplane flies—choosing your own wing curve—the plane and its parts—light plane fittings—building plans for three famous light planes; the Baby Bullet Raceplane, Alco Sportplane, Lincoln Sportplane—the how of gliding and plans for the Northrup Glider—how to make your own airplane engine—airplane welding—model making—radio in aviation—flying your own plane—an airplane catalogue and glossary of aviation terms.

**$1.00**
**A COPY AT YOUR NEWSSTAND**

You can get a copy of the Flying Manual from your nearest newsdealer or bookseller. If he cannot supply you, send one dollar—in stamps or coin—to Modern Mechanics, Minneapolis, Minn., and your copy will be sent you immediately. Modern Mechanics' Flying Manual is a Fawcett publication.

# You'll Like It!

The Only MAGAZINE *Of its Kind Ever Published*

Popular Homecraft Magazine is dedicated to those who "like to make things". It is a large magazine devoted to instruction and working drawings for working wood, metal and art craft materials.

Every hobbyist, lover of tools—art craft worker or home work shop owner will find here construction articles on model making, period and outdoor furniture—antiques—dolls—wall pieces—art specialties, etc., etc., written by experts in clear, simple language. Many articles in each issue.

## 6 Months for $1.00 *Special Offer*

Popular Homecraft is published every two months. The July issue is now out. If your news dealer is sold out, send $0.35 for sample copy, or, better still—pin a dollar bill to coupon attached to this announcement and receive three big issues postpaid. Mail it today—sure.

**POPULAR HOMECRAFT**

**739 N. Michigan Ave. Chicago, Ill.**

MAIL COUPON NOW!

Popular Homecraft
739 N. Michigan Ave., Chicago, Ill.

Dollar bill attached. Send me Popular Homecraft for next six months. Start with July ... Sept.

$0.35 enclosed. Send me sample copy.

Name .....

Address .....

City ..... State


## Crashing Planes for the Movies

*(Continued from page 186)*

over on its back. I was upside down now. The crash was over. My face was covered with mud. Directly beneath me was a pile of scrambled iron, struts, braces and parts of the steel engine mount.

The force with which I hit was sufficient to tear one of my feet from a shoe—also to knock the wind from me and break a rib on my right side. But what a shot! I had ended just four feet from a microphone and six feet from the nearest cameraman.

The majority of people who were there did not know that in dipping the right wing first there was a motive. A broken rib on the left could puncture the heart, and that organ must be protected. Shock alone could injure or stop it altogether. The stomach, too, is farther toward the left than to the right. As I eat nothing 24 hours before a crash there is little to fear from ruptures of the digestive tracts. If they were punctured it would be better not to have them filled with food.

I walked over and had my physical. There was no change of heart beats.

That was the thirty-fourth airplane which I crashed. I have still four more to do this year.

If one little strut should go wrong and play me a dirty trick should people say, "See, I told you it was all luck"?

I've crashed Spads, Fokkers, Jennies. I've smacked Standards, T.M. Scouts, and L.W.F.'s. I've pushed in S.E.5's and Thunderbirds; American Eagles, Waco's, Eaglerocks, Ryans. Each has its peculiarities. Some must be strengthened, others weakened.

Directors have told me to slip, spin and nose into the ground. They've had me fly into cliffs, buildings and church-steeples. I've had to hit and slide backwards and have been told that the shot would be useless unless I turned the plane on its back. Once I was warned that if the ship did overturn I would not be paid, which was not easy with the wind on my tail. So I welded a heavy anvil in the rear section of the fuselage. When I hit, the plane did a complete barrel roll on the crankshaft and for seventy-five feet flew in a reverse direction. The anvil alone was responsible for the success of that stunt.

Is it all luck or isn't there just a little bit of science to it? Some people call them

by Dick Grace

scientific crack-ups. Some think me a fool. The majority who have seen me do it over and over think nothing. They expect me to get results and to walk out. But even they are so excited that they can't intelligently agree as to what exactly happened. Some day I may gratify the pessimists and those who would like to have vindication for the statements they have made. Some day I may miss, but I don't expect to. I don't look forward to it. One of the worst crashes I ever had was when I slipped on wet pavement and landed on top of my mother's Christmas present—a cut-glass pitcher.

Crashes are crashes — there are many things tougher. They're not all fun but they're not all hazard. The satisfaction I get afterwards compensates me sufficiently for any little inconvenience to which I may be subjected. The gasps I've given movie fans never will equal the drama of the moment for those on the troupe.

The reward I receive is not financial. I am happy to vindicate my judgment by doing these things scientifically. I have turned destructiveness to a constructive channel, and reduced immediate accident to artful design. There is much to be learned from crashes. I've learned as I've done them, for I get the double reaction of being in the ship and then later of seeing on the screen how they look to those standing by.

When I can solve necessary crashes, when I can teach others the results of my experiments, then I will have accomplished my purpose. Until then I shall continue to crash for your pleasure. I'll be a double who tries to make thrilling pictures more thrilling—giving heros more heroics and hero-worshippers more to worship.

**$100 to $500 A Week Is Earned by Cartoonists Today**

**DO YOU LIKE TO DRAW?**

**Billy Hen's Famous Cartoon Book Will Teach You**

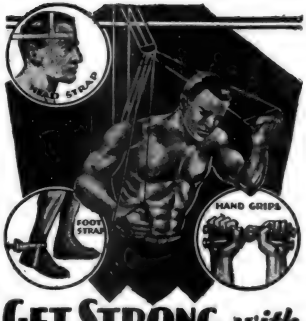
A Simple—Complete—Interesting Course in Cartooning, consisting of 30 lessons illustrated with over 300 original drawings by one of America's famous cartoonists. No better Course at any price. Sent postpaid any place on earth for only $1. Satisfaction Guaranteed.

Billy Hen's Cartoon Studio,
P. O. Box 960, MM, Hollywood, Calif.

**Learn Public Speaking**

At home—in spare time—20 minutes a day. Overcome "stage-fright," gain self-confidence, increase your salary, through ability to sway others by effective speech. Write now for free booklet, *How to Word Wonders With Words.*

NORTH AMERICAN INSTITUTE, Dept 206-S
3601 Michigan Avenue, Chicago, Illinois




**GET STRONG *with these 6 improved Muscle Builders*—All for $5.00**

Realize your ambition and develop muscles of a super-man. **Get strong!** Easily master feats which now seem difficult—or if you want physical culture for your health's sake, this equipment is what you need. With this special offer you SAVE AT LEAST HALF. We furnish 6 double chest expander adjustable until five resistances. Made of new live extra strength, spring rubber so as to give resistance you need for real muscle development. You also get a pair of patented hand grips for developing powerful grip and forearms. We include wall exercising parts which permit you to develop your back, arms and legs—a real muscle laboratory. Use to add strength gained you to exercise instead of your neck. Including by mail with free strap furnished. Privately sealed ordinances. In addition you get especially written course containing pictures and full directions telling how to develop any part of your body. ACT NOW!

**MUSCLE CLOCK FREE**

Now startling invention permits you to watch yourself getting strong. It accurately measures for you your weight lifting and pulling strength, saying progress. Included free if you order at once.

**Send No Money**

Sign name and address to coupon and rush to us. We send everything by return mail. Pay postman $5.00 plus postage. (If you desire, send money order now and we pay postage.)

**CRUSADER APPARATUS CO.,**
**Dept. 587, Maplewood, N. J.**

I accept your offer. Send me everything described in your advertisement by return mail. I will pay postman $5.00 plus postage on arrival. It is understood if I am not entirely satisfied after examination I can return the goods and you will refund my money.

**No C. O. D. Orders to Foreign Countries Except Canada.**

Name.....

Street.....

City..... State.....

# if-

**you pledge**

**yourself to secrecy we will teach you the secrets of**

***Real Professional***

# Magic

Dr. Harlan Tarbell, internationally known magician and teacher of some of the world's greatest magicians.

## Be a Magician!

***Earn $250 to $1000 a Month***

**No Salesman Will Bother You!** For the first time in the history of Magic the age-old, tradi...credly guarded secrets of Mystic Art are being revealed. Now at last you can learn to be a Real Professional Magician. Yes, and you can learn this wonderful art *easily and quickly* AT HOME. You are taught the mysterious *Principles* by which the Professional Magician works. But before you can study, you must sign the Magician's Solemn Pledge of Secrecy. This means you are getting the *guarded secrets* of the Magic Profession.

**Tarbell System, Inc., Studio B-235**
**1926 Sunnyside Avenue Chicago, Illinois**

**Tarbell System, Inc., Studio B-235**
**1926 Sunnyside Avenue, Chicago, Ill.**

Gentlemen: Without any obligation send me your free literature and information all about your wonderful "Tarbell Course in Magic." Also tell me about your Low Price Offer and Easy Payment Plan.

*Name* .....

*Address* .....

..... *Age*.....


## Mechanics of Baseball

*(Continued from page 57)*

thinking, is the style used by such hitters as Ty Cobb, Joey Sewell, Eddie Collins and Earl Combs. Here are hitters who hit any type of pitching and the reason they hit so well is that they are constantly on balance. They choke their bats, take a shorter swing and stand flat footed at the plate. Being constantly on balance they can wait until the ball is almost on them before they start their swing and the result is they are less likely to be fooled by curves or slow ones.

In my own case for instance, where I have to take a long swing and consequently must start my swing with the pitch. I'm more likely to be fooled. You can look over the big league strikeout records each year and without any further evidence you can separate the long full swingers from the "poke" hitters. The swingers are the strikeout victims. The other fellows may not hit many home runs, but they're always in there hitting that ball.

One other thing about hitting. Don't try to kill the ball. Just try to meet it squarely. A bunt, you know, if it can't be fielded, is a lot better than a long fly ball that the outfielder gets under. The perfect hit is the line ball that zips over the heads of the infielders and lands inside the range of the outfielders. Just remember that if you get your percentage of hits like that the home runs can run for Sweeney. And don't press. Take it easy! Relax! Choke your bat! Don't be over-anxious. And above all else don't swing at the bad ones.

If you will only do those things you will have mastered the first steps in the mechanics of baseball. In our game as with an automobile engine coordination is the thing. You can't expect success if the carburetor is clogged; nor can you expect success if the motor, which is the legs, aren't working in conjunction with the spark plug which is the brain and the steering apparatus which is the eyes.


# PATENTS

PATENTS Procured. Trade Marks Registered. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request.

**IRVING L. McCATHRAN, Patent Lawyer**
**703C International Bldg., Washington, D. C.**
**41C Park Row New York City**

*Make Your Own* **Summer Furniture**

## with "Delta" woodworking Units

Making things out of wood is so easy and quick with this practical, efficient, "Delta" equipment. Saves time, eliminates hard work, and produces better results. Wonderful fun, splendid relaxation as a hobby. A good money-maker too, either full or spare time. "Delta" machinery quickly pays for itself. Complete "Delta" line includes 4" Jointer, Circular Saws, Wood-Turning Lathes, Jig-Saws, Band Saw, Moulding Cutter, and numerous other items of interest to woodworkers—all at astonishingly moderate prices.

**BLUEPRINTS**

$1 We will be glad to furnish our complete set of 10 Working Blueprints of Summer Furniture upon receipt of $1.00.

**10 DAY TRIAL—**
**Easy Terms**

For complete details and full description, send coupon. You will learn, also, how you can try any Delta equipment for 10 days under actual working conditions at our risk. Choice of three convenient payment plans. Mail coupon TODAY! Dept. N-730.

**Delta Specialty Co.**
**Milwaukee, Wis.**

DELTA SPECIALTY COMPANY, Dept. N-730
Division of "Delta Manufacturing Co."
1661-67 Holton St., Milwaukee, Wis.

Please send me FREE illustrated literature describing 1930 model Delta Woodworking Units. Also details of 10-Day Trial Offer and Easy Payment Plans.
☐ I enclose $1.00 for set of 10 Summer Furniture Blue Prints.

Name .....

Address .....

# MAKE MUCH MONEY

Making and Selling Your Own Products. Formulas, Processes, Trade-Secrets. All lines. Automobile Specialties. Cleaning, Polishing Compounds. Food Products. Toilet Preparations, etc. Expert Analytical Service. Catalog, circulars free.

**A. THAXLY CO.**
**Washington, D. C.**

# PATENTS

Trade Marks, Copyrights, Patent Litigation Handbook with illustrations, 100 mechanical movements. Sent free on request.

**ALBERT E. DIETERICH**
formerly member examining corps U. S. Patent Office
PATENT LAWYER and SOLICITOR
261-A, OURAY BLDG.
30 Years' Experience Washington, D. C.

# GOV'T POSITIONS

**$35 TO $75 WEEKLY**

MEN WOMEN — AGE 18 TO 55

| | |
|---|---|
| ( ) Railway Mail Clerk | ( ) Meat Inspector |
| ( ) P. O. Clerk | ( ) Special Agent |
| ( ) P. O. Laborer | ( ) Customs Insp. |
| ( ) File Clerk | ( ) Steno-Typist |
| ( ) Matron | ( ) Immigrant Insp. |
| ( ) General Clerk | ( ) City Mail Carrier |
| ( ) Chauffeur-Carrier | ( ) Border Patrol |
| ( ) Skilled Laborer | ( ) Typist |
| ( ) Watchman | ( ) Seamstress |
| ( ) Postmaster | ( ) Steno-Secretary |
| ( ) R.F.D Carrier | ( ) Auditor |

**Instruction Bureau, 233, St. Louis, Mo.**
Send me particulars about positions marked "X"; salaries, hours, vacations, "How to qualify" etc.
Name .....
Address .....

# MODEL AEROPLANES

3, 6, 8 cylinder air motors.
5 foot motor driven Lockheed.
2 foot rubber driven scale models.
**10c For Catalogue**
**Miniature Aircraft Corp.**
**83 Low Terrace New Brighton, N. Y.**

**22 Cal. Blank Automatic**

100 CARTRIDGES Free

You need no license or permit to own this 6-shot Blank Automatic. Therefore, keep away from children. Fool your friends. Same as an expensive automatic in construction, finish, appearance, durability; automatic magazine loading and ejection of cartridges, powerful report. Guarantee absolutely safe. Send no money. Pay on delivery $4.98. JENKINS, 685 Broadway, New York, Dept. G262

# *In this . .*
# FREE BOOK
**a World-Famous Flier shows how *YOU* can get into**
# *AVIATION*

**Walter Hinton**

Trail - blazer, pioneer, explorer, instructor, AVIATOR. First to pilot a plane across the Atlantic—the famous NC-4—and first to fly from North to South America. First, too, to explore the upper Amazon jungles. The man who was a crack flying instructor for the Navy during the War, who today is training far-sighted men for Aviation. His Book is yours FREE for the coupon below.

HERE is the book that tells exactly what Aviation offers YOU. Walter Hinton—hero of history-making flights—shows you exactly where your opportunities lie, exactly how to fit yourself for them. Here is a book for men with too much good sound business sense to let this opportunity of a lifetime outgrow them!

## Aviation is Ready---Hinton is Ready---Now It's Up to YOU

There's BIG PAY plus fast growth and a *real future* for YOU in Aviation. Your one sure move is to get the *right training*—QUICK!

Hinton will train *you* for Aviation, right at home in spare-time. His proved course teaches *all* about plane construction, rigging, repairs, motors, instruments, theory of flight, navigation, commercial Aviation. Whether you plan to fly, or want one of the *forty* Big Pay ground jobs, Hinton's Free Book tells you how to start. Clip the coupon and send it TODAY!

*Mail Now for Facts*

Walter Hinton, Pres., 222-J
**Aviation Institute of U. S. A.**
**1115 Connecticut Ave., Washington, D. C.**
Send me your FREE Book telling how I can train under you right at home for Aviation.

Name .....

Street ..... Age .....
(Must be 18 or over)

City ..... State .....


## Miracles of Mechanics

*(Continued from page 108)*

don, when the cause seemed lost due to slackened speed caused by insufficient fuel, Greystoke is reported to have purchased the vessel on which he was voyaging, stripping her of all woodwork including her ornate furniture. This was all put to the ax and fed to the boilers in the desperate hope of winning. Success crowned his efforts, though the wager, 5,000 pounds Sterling, barely paid for the feat.

Another tale which chronicles what is most certainly a miracle of mechanics is the story of Adam Petrowicz, a caisson worker who was blown through 70 feet of mud from under a caisson in the Hudson river. He lived to tell the tale, and suffered no ill effects.

The caisson in which he had been working was of the type which in the early days of civil engineering would have been termed a diving bell. It is used for "drying up river bottoms." Hollow, cylindrical, heavy, it is floated over the spot in a river bed where a piling or a pier is to be sunk into the hard clays that usually underlie the muck of a river bed. Then the caisson is pumped full of water, which sinks it. As it settles into the muck, air is pumped into the inner portion of the big steel tank, thus expelling the water, and enabling men to descend to the river bottom to do the necessary excavating. All the dirt shoveled out from under the caisson causes it to settle, and an endless belt carries the muck and silt out through an opening in the top, and dumps it overside.

Thus it was that on a May morning in 1926, Adam Petrowicz was approximately thirty feet below the mud bottom of the Hudson river, and many feet below the surface of the water.

Of a sudden the shovels of the crew in the caisson bit through the hard clay into what proved to be a gushing spring of water. Immediately the ground under the caisson began to soften, the caisson to settle. The settling caused an accident to the air line, shutting off the air pressure. This precipitated a stampede among the workers in the caisson, and Adam Petrowicz, after the mad scramble to freedom, found himself shut off from escape through the upper door of the caisson with water rising rapidly under him, and with the air pressure decreasing rapidly.

*(Continued on page 194)*

# New Shoe Soles

10¢

**We Pay Agents Just for Testing It**

Uncanny new discovery makes it possible for any man, woman or even a child to put on brand new soles and heels in three minutes—for the amazingly small sum of 10c. It is a queer leather paste, called Re Sole. Spreads on smooth and even with a knife, like butter. Sets overnight and never again softens. Makes the sole flexible, comfortable and waterproof. Wears and looks like leather. Re Sole fills up holes, covers worn out places, levels heels in a jiffy. No experience or skill required. Now shoe soles need never wear out.

## Full-Size Can FREE

Every man, woman and child is a prospect for Re Sole. That's why we are swamped with orders. County agents needed everywhere to fill the high demand. You don't have to make sales to make money. We give agents a free supply of Re Sole to start and guarantee you a profit whether you sell or not. Men and women who want to be $60 a day agents, are urged to send coupon for amazing free sample can offer. (Enough for 20 soles.) Also details of guaranteed profits. Whether you want to be an agent or not, rush coupon now for free offer.

**We Guarantee Agents A Profit For Merely Showing Re Sole To Friends**

**----Rush This for Guaranteed Profit Offer----**

**Universal Laboratories, Inc., Suite B-576**
**Garver Bldg., Des Moines, Iowa**

Send me your free can offer to agents and tell me how I can make up to $40 a day with your new sales plan. Also explain how you will pay me for just testing and showing people.

Name .....

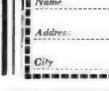
Address .....

City ..... State .....

Send for Special Offer

You don't need to make sales to make money. We can afford to make this daring profit guarantee because of the widespread and urgent need of Re Sole. Mail coupon for complete facts on this sensational offer. **Do it now.**

---



Model No. 21

## MONTHS of THRILLING FLIGHTS

Since July 1, 1929 **Silver Arrows** have flown 200,000 miles. In 183 recent tests out of 200, they outflew all other planes, regardless of price. A **proved** success! Not a construction toy but fully built. Ready to fly in a moment. Balsa wood wings; aluminum cabin, propeller; strong elastic motor. Model No. 21. Cabin type, wing spread 22 in., $2.50 (West of Miss., $2.75). Other models, Racing and Cabin, at $1 to $5.50. If your dealer cannot supply you, send your order to us. Kingsbury Mfg. Co., 106-G Myrtle St., Keene, N. H. Join **Silver Arrow** Flying Club and become a Master Pilot.

## KINGSBURY MOTOR DRIVEN TOYS

FREE! Novelty Moviescope; shows motion picture of Silver Arrow flight. Also complete toy catalog.

Send 10c for Kingsbury Disc Wheel Balloon Tire Eraser. Set of 4, 35c.

---

## LEARN AVIATION

Be a Licensed PILOT or Mechanic

**From the Ground Up**

complete Aviation course in Aeronautics Covers every part of this fascinating profession. Theoretical—Practical—Authoritative—Complete! Indispensable whether now flying or preparing to fly. Explains mechanics of Airplanes and Piloting a ship, from ground up, in terms of plain, clearly understood language. This course starts you right so you quickly master Aviation and learn to fly quickly. Written by U. S. Army Officer who flew before, during and after the War. Scores of subjects covered are: Details of Airplane Engines, Fuel Systems & Carburetors, Airplane Construction, Flight, Navigation, Handling Ship, Stunts & Maneuvers, Air Regulations etc. You can't be without this wonderful complete course. Become an Expert Aviator or skilled Airplane Mechanic and always be employed! Earn Real Money! Big demand for trained men in this uncrowded profession can't be filled! Sky is your limit! Send only $3.50 with your order and we pay postage or just send name and address and pay postman $3.50 plus postage when received.

THE MAIL ORDER CENTER, 1715 Madison Ave., New York City

---

## ENGINEERING DEGREE IN 2 YEARS

*Want to know about airplanes? Send for catalog now!*

BY ELIMINATING non-essentials and intensifying courses, Tri-State College offers Bachelor of Science degree in engineering in 2 years. Courses in Aeronautical, Civil, Electrical, Mechanical, Chemical, and Administrative engineering.

Thorough instruction according to individual ability. No entrance examinations. Students who left high school can make up work. Living expenses and tuition low. Graduates hold responsible positions. 46th year. Enter in September, January, March and June. Write for catalog now! 670 College Street, Angola, Indiana.

## TRI-STATE COLLEGE

**WANTED MEN**
Looking for a Chance to Start Own Business

Making METAL TOYS and NOVELTIES
As Our Representative
Offers Unusual Opportunities for Big Profits.
Big demand for 5 and 10c Store Novelties, Ashtrays, Toy soldiers, Auto Radiator Ornaments, etc. We cooperate in selling goods you make; also buy these from you. Small investment needed to start and we help you build up. WE FURNISH COMPLETE OUTFITS and start you in well paying business. Absolutely NO EXPERIENCE and no special place needed. A chance of a lifetime for man with small capital. Write AT ONCE if you mean strictly business and want to handle wholesale orders now being placed.
METAL CAST PRODUCTS COMPANY
Dept. 2, 1696 Boston Road New York City

LEARN TO PAINT SIGNS & SHO CARDS!
Complete instruction book written in plain language entitled "HOW TO PAINT SIGNS AND SHO CARDS" teaches you this money-making trade easily, quickly. No talent or experience required. Earn good money spare or whole time. EXPLAINS EVERYTHING. Alphabets, Colors, HOW TO MIX PAINTS, Show Cards, Window Board and Wall Signs, Ready-made letters, Gilding, TRICKS OF THE TRADE, etc. Contains 100 alphabets and designs. SPECIAL OFFER: FOUR BALL BEARING SHOW CARD PENS FREE if ordered at once.
SEND NO MONEY
Just send your name and address. We'll send this remarkable book with pens at once. On arrival pay postman only $2.98 plus few small additional shipping charges. Money back in 5 days if not pleased. Price outside of U. S. $3.20 Cash with order.
Globe Publishing Co., Div. 31, Syracuse, N. Y.

NEW YEAR — NEW IDEA
PATENT YOUR IDEAS
Call or send me a sketch of your invention. Phone Longacre 3088
FREE Inventors Recording Blank
Confidential Advice
U. S. and Foreign Patents secured by
Z. H. POLACHEK Registered Patent Attorney
1234 BROADWAY, Consulting Engineer
NEW YORK

**How To Secure A Government Position**

Why worry about strikes, layoff's, hard times? Get a Government job! Increased salaries, steady work, liberal, good pay. I'll help you become a Custom House Clerk, Railway Postal Clerk, Post Office Clerk, City Mail Carrier, Rural Carrier—or get hold of any other Government job you want. I was a Secretary Examiner of Civil Service Commission for 8 years. Have helped thousands. Railway Postal Clerk examination coming. Now FREE My 32-page book tells all about the Jobs, opportunities and how I can help you get one. Send the coupon for your copy TODAY.

A. R. Patterson, Civil Service Expert,
PATTERSON SCHOOL, 457 Wisser Bldg., Rochester, N. Y.
Please send me, without obligation, your free book "How to Secure a Government Position."
Name .....
Address .....


## Miracles of Mechanics

*(Continued from page 192)*

Meanwhile, on the surface of the caisson, the man who closed the trap proved to be a hero. As he reached the top, he found the water of the river surface lapping hungrily at the door to the caisson and realized that the caisson might founder at any moment, thus certainly killing Petrowicz. In a flash he closed the trap tightly, jamming it with the clamps, and connected the whipping air hose as pressure for a moment was stopped from the attending tug's air pumps. Then the signal to "blow" was given.

Tense moments passed at the surface. Air was being forced into the caisson at an unprecedented rate. Trapped below, partly the result of tragic accident, partly because of the frenzied thinking of an escaped worker, the life of a man hung in the balance.

Suddenly the caisson lurched. There was a mighty geyser of mud and water. The air had blown through thirty feet of muck and as many more feet of water! The caisson righted itself, and when the turmoil on the surface subsided, Adam Petrowicz was seen swimming unhurt toward the tug!

No less fraught with interest is the illusion nature sets before travelers on the desert. This illusion, commonly called the mirage, is caused by reflection and refraction due to the waves of heat commonly found over deserts. There are two types of mirage. One is as illustrated on page 108, and shows how an image may appear to be upside down on the sands in front of the desert voyager. Another type is called the complete mirage, and is made by the ground image shown on page 108 being reflected in the sky by a strata of warm air at about the level indicated by the line "warm air beams."

In such a case the ground image is reversed again and appears to be very real. The danger to travelers lies in the fact that it is very easy to be misled by these mirages. Oases appearing to be five miles or less distant may often be thirty or forty miles away, and when the traveler has gone off his beaten path, the mirage often vanishes when he has gone beyond the limits of refraction in which the image appears. Thus, without a landmark, the traveler finds himself lost, off the beaten path, and as the sand of the desert is fine as dust his tracks are

*(Continued on page 196)*

## An Epic in Gangland!

# RACKETEER

**THE DYNAMIC STORY of an adventurous youth who was mistaken for the most deadly killer in crookdom.**

... BY ...

# H. Bedford-Jones

*in the July issue of*

**Now On Sale At All Newsstands**

THE BRAND OF THRILLING FICTION

**Triple-X Magazine**

DETECTIVE
AIR-WAR
WEST

**ALSO in this issue . . . . .**

**SIX-GUN GOSPEL**
By Homer King Gordon

**PIZEN MEAN**
By Jay Lucas

**TO THE FRONT IN A HEARSE**
By Arthur Guy Empey

If your newsdealer is sold out, send 25c to Triple-X Magazine, Fawcett Publications, Inc., Minneapolis, Minn., and a copy of the July issue will be mailed to you promptly. Or, better yet, send in $1 (bill or stamps) and take advantage of the SPECIAL OFFER that gives you the next five issues for a dollar.

NEW SCIENTIFIC WONDER
"X-RAY" CURIO
Reg U S Pat Off
X-RAY CURIO
10c
3 for 25c
"Silver Only"
BOYS BIG FUN. You apparently see Clothes, Wood, Stone, any object. See Bones in Flesh. FREE PKG. radio picture films. Take pictures without camera. "You'll like 'em." 1 pkg. with each 25c order.
MARVEL MFG. CO., Dept. 88, NEW HAVEN, CONN.

PATENTS
Before showing your idea to anyone, send for my new DUPLICATING INVENTION RECORD—you keep a copy for evidence and send me a copy for advice and exact cost of patent. Prompt personal service. Advice and record free on request.
JOHN J. LYNCH, Reg. Patent and Trademark Atty.
815 Park Row, New York City
704-A International Building, Washington, D. C.

Learn to PAINT SIGNS and SHOW CARDS
We quickly teach you by mail, or at school, in spare time. Hardwood Surfaces. Interior Wall work. Oldest, foremost school. EARN $50 TO $200 WEEKLY
Illustrated, 36th home-study graduate, made $15 first week. Another writes, "Increased my pay $25 first week." Mrs. Edith Vanzo, M. says she got $25 for a show card. Drawford, R. C., writing: "Earned $280 while taking course." Write for complete information.
DETROIT SCHOOL OF LETTERING
191 Stimson Ave. Est. 1899 DETROIT, MICH.

BUCHSTEIN'S FIBRE LIMB
is soothing to your stump—strong, cool, neat, light. Guaranteed 5 years. Easy payments. Send for Catalog today.
I. Buchstein Co.
610 3rd Ave. So.
Minneapolis, Minnesota
Also fibre arms, and braces for all deformities.

Factory to Rider
Save $10 to $25 on the Head Hercyle you select from 44 Styles, colors and sizes.
30 Days' Free Trial
Ship on approval. If not entirely satisfactory after trial return the cycle. EASY PAYMENTS. $2 Down on RANGER Bicycles.
Tires lamps, wheels, equipment at half usual prices. Write for marvelous new offers, wonderful 30-day trial offer and terms.
Mead Cycle Company Dept. R290 Chicago
Write us today for free catalog

Makes Ford a Tractor
We furnish everything for converting Ford Auto Chassis into Farm Tractor for truck growers, smallfarms, orchards, etc. Fully 40 in Plow Capacity. Several Plow Grades; Ronethan Machinery. We also build Garden Tractors and Cutter Bar Mower Attachments. Write for Free Particulars.
SHAW MFG. CO., Dept. 8807 GALESBURG, KANSAS
Handles Easily. Turns in 10-ft. Circle

FIFTY-SHOT TARGET
$3.98 Practice Air Automatic
Box of Ammunition Free.
Guaranteed to hit a fly at ten feet. The ideal pistol for target practice. Get one today and become a good marksman in short time and at very little expense. Shoots buckshot with accurate precision and great force. Holds fifty shots in magazine. Easy to reload. Excellent for hunting birds, etc. Looks like a real pistol. SEND NO MONEY. Pay on delivery $3.98 plus small express charges.
JENKINS, Dept. G-26-W, 605 Broadway, New York

## Miracles of Mechanics

*(Continued from page 194)*

erased by the wind. Many examples of the will-o'-the-wisp characteristics of the mirage are on record.

Another, and probably as interesting an example of miracles wrought by mechanics, is the famous Angel of Mons illusion. During the war, troops on the Russian front were made to drop their arms and retreat in terror when, above the German and Austrian lines, clever German military tacticians projected angels through a "magic lantern" onto low lying clouds and smoke columns. This famous illusion became widely rumored, and though few saw it, due to the comparative difficulty of securing right weather conditions, Allied scientists attributed the illusion to mass hypnotism.

## Battery Runs Model Cruiser

*(Continued from page 176)*

Apply varnish or shellac liberally on the joints before screwing down. When the latter is dry, with sandpaper, jackknife and rasp smooth the uprights and make them flush with deck and bottom piece so that the pasteboard planking will fit evenly all around.

Use any tough pasteboard, such as a clothier's delivery box, and cut it in the general outline you require. The edges are later trimmed with a sharp knife or razor-blade. Before nailing it down with cigar-box nails, coat the edges of deck and bottom piece with a generous amount of varnish or shellac. Start nailing at the stem, placing nails about half an inch apart.

After the sides are finished cover inside and out with good spar-varnish, working it well into all cracks, but taking care not to get any in the propeller-shaft tube, as this will gum up the shaft. It would be well to give your deck a mahogany stain before starting the varnish job.

A section of ⅛-inch shaft from a toy construction set was used for the propeller shaft. Cut the propeller from a circular piece of tin or sheet brass about 1¼ in. diameter. Experiment will tell you how far to bend the blades for best results. Solder the propeller to a standard brass set-collar and it is readily assembled on the shaft.

For the deck house or cabin use a piece of tobacco tin, soldering the flat roof to the horseshoe-shaped sides.


*Thank You for Mentioning Modern Mechanics and Inventions for July When Writing to Advertisers*

# Saps and Sappers

*by*

## ARTHUR GUY EMPEY

The amazing story of two dumb doughboys who didn't need blueprints to tell them what to do when they found themselves in a German tunnel packed with T.N.T.

**In the JULY Issue of**

**AT ALL NEWS-STANDS**

Fawcett's **Battle Stories**

**ON SALE JUNE 10th**

***Beginning in this issue---***

## The Golden Death

By **Major Malcolm Wheeler-Nicholson**

A thrilling novel of doughboys on the Russian front

***And also war stories by***

**Harold Cruickshank — Frederick Painton — Major George Eliot—Lieutenant Edwin Parsons—Joseph Ball and others.**

If your newsdealer is sold out, send 25c to Battle Stories magazine, Fawcett Publications, Inc., Minneapolis, Minn., and a copy of the July issue will be mailed to you at once. Or, better yet, send $1 (bill or stamps) and assure yourself of the next five issues.

Trained Men In **Aviation** Wanted At Once

How are YOU going to prepare yourself for the BIG PAY JOBS? Study at home or go to school? Before you decide — write us about positions open and how to get them.

We will train you during your spare time by one of the most thorough systems of practical home aviation training ever devised. Prepared by Experts. Endorsed by Aeronautical Executives.

**ACT NOW! WRITE US TODAY**
**"We bring the FLYING FIELD to your Door."**

**NORTH AMERICAN COLLEGE OF AVIATION**
4615 33rd Ave. So. Desk 2. Minneapolis, Minn.

**NERVES?**

Are You Always Excited? Fatigued? Worried? Gloomy? Pessimistic? Constipation, indigestion, cold sweats, dizzy spells and sex weakness are caused by NERVE EXHAUSTION. Drugs, tonics and medicines cannot help good, and never will. Learn how to regain Vigor, Calmness and Self Confidence. Send 25c for this amazing book.

RICHARD BLACKSTONE, N-337, Flatiron Bldg., N. Y. C.

**Here's a Tip!**

Everybody sez: . . . .

Better than "The Specialist"

"The Country Plumber" is without a doubt the greatest gloom chasing gale of snorts out-door conscious America has ever been treated to. You'll have to double-guard the buttons on your vest when you start reading Phil Potts' side-splitting rebuttal to Lem Putt's theories in "The Specialist."

"The Country Plumber" is a beautifully bound volume of chuckles and printed on the finest tissues of ripple finish paper. A host of convulsing illustrations.

On Sale at all newsstands, $1 a copy. Or send your dollar bill to the Country Press, P. O. Box 1796, Minneapolis, Minn.

## How to Build "Sez You"

*(Continued from page 135)*

in fastening the transom and stem piece. Note the knees and the inside edging of the same size as the vertical frames, 1"x¾". This serves to face out the thickness of the transom and stem edges. Along this seam when you plank the boat you can lay a thin strip of outing flannel, soaked liberally in white lead paint, and the boat will leak nary a drop if your joiner work has been fair-to-middling.

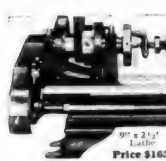
The boat, of course, will now be put upside down on two horses, and it must be seen to that the tops of these horses are level and on the same plane.

Then the three transverse bottom frames are put in at the stations noted in the plans, notching them around the chine piece. These are fastened through the chine and through the planking the same way transom and the stem piece were fastened. Then the side members or 1"x¾" vertical frames are put in.

The transverse frames of 4" by ⅞" white oak are notched for the battens which run along the bottom to cover the seams in the planking and to serve as backing for the planking of ½" cedar.

These battens are of ⅜"x1" white oak. They run from the inside face of the transom to the inside face of the stem. In the stem, however, they are notched, as there is no other way for them to be held without a backing piece, and in the transom it is a good plan to run them into boxes cut half way through the transom. The planking can now be put on, and should be fastened with screws, ¾" No. 7, brass or galvanized, at the frames, three to a strake of planking, and with 1" copper clout nails spaced on 1½" centers along the seam edge into the battens. To put these copper clout nails in, you will have to have a small breast drill with a drill a bit smaller than the diameter of the nails, which are approximately square in section, and drill through the cedar and the oak. Then, with a helper holding a two or three pound flat iron under the oak, you can set the nail in with a hammer and clinch it good and tight.

With the addition of seats, and a tie piece at the loose ends of the bottom planks on the transom, there is nothing further to do but paint the boat. The best way to do this is to prepare a mixture of half boiled linseed oil and half turpentine.

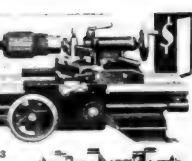


9" x 2½" Lathe

**Price $163**

**Work this Lathe Will Do**

—Machine armatures—Make bushings
—Reface valves —Machine pistons
—Undercut Mica —Cut thread dies
—Bore, file, drill, turn, face, grind, polish and hundreds of other jobs.



**$1 A MONTH**

# 41 for 9"x2½" LATHE

Use this famous New Model South Bend Jr. Lathe while you pay. It's a Back Geared, Screw Cutting Precision Tool. Same high quality throughout as our other Lathes used by Studebaker, General Motors, Ford, General Electric, Radio Corporation, Westinghouse and others.

Lathe comes complete with equipment. Weight, 350 lbs. Write for Free Catalog.

**"How to Run a Lathe"** Latest edition of this famous work. Simplest, most complete and practical book on lathe operation. Contains 144 pages, fully illustrated. Shows how to handle all classes of work on the lathe. Sent postpaid anywhere in U.S.A. Coin or Stamps or any Country accepted.

**25¢** Post Paid

**SOUTH BEND LATHE WORKS**
**266 E. MADISON ST., SOUTH BEND, IND., U.S.A.**

---

BUILD YOUR OWN AIRPLANE and fly it yourself! You will find complete plans for the *Baby Bullet* Raceplane, the *Alco* Sportplane, the *Lincoln* Sport Biplane, and the *Northrop* Glider in the FLYING MANUAL, on sale at all newsstands —one dollar.

---

**25 POWER 81**

**GERMAN POCKET MICROSCOPE**

A marvelous German 25 power microscope, size of pencil. Enlarges distantly 25 times. Ideal for students, collectors, etc. Has 3 lenses and extra large eye lens for longer study. Only 3½ inches x 3/4 inch. Fine for examining fabrics, insects and other things. Operates on new principle. Guaranteed. $1 prepaid. Money back guarantee. Discount for 6 or more. Over 200 Glasses Also Binoculars $4-$110

**BINOCULARS**

Prismatic or Opera glasses, sold and exchanged. Lenses and optical instruments of every description. Largest concern in America. Catalog gives all information how to choose the best glasses for your purpose. LOWEST PRICES.

DuMAURIER CO., Dept. 147, ELMIRA, NEW YORK

---

# NEW LOW PRICES

**GOODRICH-GOODYEAR Firestone - U.S. AND OTHER TIRES**

12 MONTHS SERVICE GUARANTEE

**Lowest Prices on Earth!**

Thousands of satisfied users all over the U.S.A. Our 15 years of honest dealing for these first-class reconditioned tires will supply you with reconstructed standard makes tires of lowest prices in history. **Guaranteed to give 12 months' service**

**Don't Delay—Order Today**

| CORD Tires | | | BALLOON Tires | | |
|---|---|---|---|---|---|
| Size | Tires | Tubes | Size | Tires | Tubes |
| 30x3 | $2.25 | $0.90 | 29x4.40-21 | $2.25 | $0.90 |
| 30x3½ | 2.75 | 1.00 | 29x4.50 | 2.40 | 1.15 |
| 31x4 | 2.95 | 1.15 | 28x4.75 | 2.85 | 1.20 |
| 32x4 | 2.95 | 1.15 | 30x4.95 | 2.90 | 1.35 |
| 33x4 | 2.95 | 1.15 | 29x5.00 | 2.90 | 1.35 |
| 32x4½ | 3.25 | 1.45 | 30x5.00 | 2.95 | 1.35 |
| 33x4½ | 3.20 | 1.45 | 31x5.25 | 3.10 | 1.35 |
| 34x4½ | 3.25 | 1.45 | 30x5.50 | 3.20 | 1.40 |
| 35x4½ | 3.45 | 1.45 | 32x6.00 | 3.20 | 1.40 |
| 30x5 | 3.45 | 1.65 | 33x6.00 | 3.25 | 1.65 |
| 33x5 | 3.65 | 1.65 | 32x6.50 | 3.50 | 1.65 |
| 35x5 | 3.75 | 1.65 | All Other Sizes | | |

**Send only $1.00 deposit** with each tire ordered. Pay balance C. O. D. Deduct 5 per cent if cash accompanies order.

Three failings to give 12 months service will be replaced at half price.

**YORK TIRE & RUBBER COMPANY, Dept. 3055**
**3855 Cottage Grove Ave. Chicago, Illinois**

**DEALERS WANTED**

---

# TOBACCO HABIT BANISHED

**FOR THOUSANDS OF MEN**

**QUICK, SURE, LASTING RESULTS**

In most cases Tobacco Redeemer relieves craving for tobacco completely in a very few days. An absolutely safe, dependable, and thoroughly scientific treatment. No matter how long the habit, or in what form used, all craving for tobacco usually vanishes when this pleasant, inexpensive treatment is used according to simple directions. The treatment has helped thousands—and should help you. Your money returned without argument or question if not satisfied. Write for free explanatory booklet and proofs of what Tobacco Redeemer has done for men addicted to the tobacco habit. Send post card or letter today.

NEWELL PHARMACAL CO.
Dept. 867 Clayton Station St. Louis, Mo.

---

# TRAVEL - for 'UNCLE SAM'

**RAILWAY POSTAL CLERKS**
**MAIL CARRIERS—POSTOFFICE CLERKS**
**GENERAL CLERKS—CUSTOMS INSPECTORS**

**$1700 to $3400 a Year for Life**

No layoffs because of strikes, poor business, etc. — sure pay — rapid advancement. Many other U. S. Government Jobs. City and country residents stated same chance. Common sense education usually sufficient.

**STEADY WORK**

Cut coupon and mail it before turning the page.

**MEN—BOYS 18 to 45**

**Use Coupon Before You Lose It**

COUPON

FRANKLIN INSTITUTE, Dept. J-317, Rochester, N. Y.
Rush to me, free of charge, (1) full description of the positions checked below, (2) 32-page book with list of positions obtainable, etc. Tell me how to get the position checked.

| | |
|---|---|
| Railway Postal Clerk ($1900 to $2700) | General Clerk ($1260 to $2100) |
| Postoffice Clerk ($1700 to $2300) | Customs Inspector ($2100 up) |
| City Mail Carrier ($1700 to $2100) | Rural Mail Carrier ($2100 to $2500) |

Name .....

Address .....

---

BUILD & FLY A GLIDER

from plans and instructions of the Grey Goose Glider,—closed fuselage, sturdy and stable. Anyone can build it with ordinary tools and best of all a small expenditure of money.

WRITE TODAY

Send 3c in stamps for the "dope" on Glider Design. Free Consultation Service and other valuable features.

GREY GOOSE GLIDER ASS'N.
Box 93 Dept- B Minneapolis, Minn.

TEAR GAS FOUNTAIN PEN GUN!

100% Protection—*No Injury*

Amazing Invention. Has Size, Shape and Appearance of a Fountain Pen BUT—it shoots TEAR GAS. A safe, effective substitute for dangerous firearms. Just point it—release safety trigger and project a cloud of Blinding TEAR GAS. Instantly Stops, Stuns and Incapacitates the most vicious Man or Beast. Police, Watchmen, Express, Chauffeurs, Women, Those Fear Tear Gas more than bullets. Carry it Openly or Concealed. Protect yourself, family, to protect life and property. No skill required. Ideal protector for Motorists and Women. Shoots far enough to reach to effect user. Uses same Tear Gas Shells as Official Police Equipment. Precision built. Not a Toy.

AGENTS: Here is the ONE BIG SELLING sensation of the year. Quick Sales—Big Profits. Everyone who sees it wants one. Earn up to $25.00 Daily. Make an amazing demonstration that rolls in the money. Write Today for details and Special Introductory Offer. Send No Money. Extra Ammunition and Demonstration Outfit *(Retail value $2.50)*. Not Sent C. O. D.

LACHAYTTE CO., P.O. Box 1719-B-3, CHICAGO, ILL., U.S.A.

Learn to Fly Free!

Here's your great chance to learn to be an airplane pilot—and best of all, it won't cost you a cent! Every month **Modern Mechanics** gives some lucky young man or woman a free course in flying. For full details, turn to page 76 of this issue. Think of the fun and profit in learning to pilot an airplane! Your chances of winning this great prize are as good as the next fellow's!

## Bringing the Mail Through

*(Continued from page 113)*

*City of Mexico* and only 22 hours are required to cover the distance from Chicago to the city of the neighboring republic. This is an extension of a route established only last February between Dallas and San Antonio, Texas.

The government is ready to ask for bids for carrying mail from Key West, Florida, to the Canal Zone. Stops will be made on this route in Havana, Cuba; Merida, Mexico; in Honduras; and Costa Rica.

Another route from Key West to Porto Rico includes Havana, several cities in Chile, and Haiti. For sometime routes have been operating between the States and Canada so that the whole of North and parts of South America are linked closer together, not only in a commercial way, but the ties of friendship have been more firmly fixed.

In five years all first class mail will be carried by aeroplane, according to W. Irving Glover, second assistant postmaster general, who is in charge of the air mail. The government has always used the most rapid means of getting mail to its destination and the air service is the fastest at the present time.

While steps are being taken at home to speed up the mail, there already is mention made of the possibility of foreign service. Postoffice officials believe that within ten years such service will be established and they are ready now to let contracts to any company or individual who demonstrates the ability to carry them out.

MAKE YOUR INVENTIONS PAY

Millions have been made from ideas properly developed and protected by inventors. One of the first steps is the development of a practical working model. Send us rough sketch or model of your idea. We will submit complete report backed by 30 years experience in model making. Confidential service. Modern equipment. Rank references furnished. FREE booklet "Making Inventions Pay"

CRESCENT TOOL COMPANY, Dept. K, Cincinnati, Ohio

Want a Government Job?

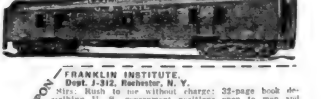
RAILWAY POSTAL CLERKS
MAIL CARRIERS

$1700 to $3000 Year

TRAVEL—See your country on government pay

MEN—WOMEN, 17 Up SHOULD MAIL COUPON IMMEDIATELY.

*Steady Work* *No Layoffs* *Paid Vacations*



COUPON

FRANKLIN INSTITUTE,
Dept. J-312, Rochester, N.Y.

Sirs: Rush to me without charge: 32-page book describing U. S. government positions open to men and women, with list of positions and full particulars telling how to get them.

Name .....

Address .....

# BUILD a CANVAS CANOE!

COMPLETE PLANS FOR THIS FINE CANVAS CANOE
WITH BLUEPRINTS, WILL BE FOUND IN

## Modern Mechanics'

# *How - To - Build - It*

## THE HOME CRAFTSMAN'S MANUAL FOR 1930

*Price 50 Cents* — *At all Newsstands*

### EVERYTHING FOR THE HOME WORKSHOP FAN

Everybody who likes to wield a hammer or saw a board will find something in How-To-Build-It that will appeal particularly to him. This great manual, crammed full of plans for worthwhile projects, is entirely unique —you've never seen anything quite like it before! It contains working prints, photographs, line drawings, and complete explanatory text, easily understood, for each of the articles it presents. A partial list of contents, printed at the right, gives you some idea of what the book contains.

LOOK for THIS COVER

### PARTIAL LIST OF CONTENTS:

How to Build a 15-foot Sailboat
Making an Electric Auto
Your Own Marionette Show
Swimmer's Diving Submarine
Model Airplanes
Furniture for the Home
Log Cabin Summer Camps
A Glider that Rises Off Water
A One-Tube Radio Set
Building a Magic Lantern
How to Make a Steam Engine
An Ozone Generator for the Home
Electric Motors
Scooters, Sleds, Toys, Iceboats
and hundreds of other features.

If your news dealer is sold out, send 50 cents to Fawcett Publications, Inc., Minneapolis, Minn., and a copy of How-To-Build-It will be sent to you at once.

## Play the Hawaiian Guitar like the Hawaiians!

**Only 4 Motions** used in playing this fascinating instrument. Our native Hawaiian instructors teach you to master them quickly. Pictures show how. Every thing explained clearly.

**Play in Half Hour**
After you get the four easy motions you play harmonious chords with very little practice. No previous musical knowledge needed.

**Easy Lessons**
Even if you don't know one note from another, the 52 printed lessons and clear pictures make it easy to learn quickly. You'll be playing

**GIVEN** ... when you enroll a sweet toned **HAWAIIAN GUITAR, Carrying Case and Playing Outfit— Value $18 to $30**
*No extra charge for outfit*

WRITE AT ONCE for attractive offer and easy terms. You have everything to gain. A postcard will do. ACT!

TENOR (and other courses. The same thorough instruction on Tenor Banjo, BANJO Plectrum, Tiple, Ukulele, Banjo Ukulele, Banjo Mandolin, Violin, Guitar, Hawaiian Steel Guitar. Write for full information.

FIRST HAWAIIAN CONSERVATORY OF MUSIC, Inc.
9th Floor, Woolworth Bldg. Dept. 688. New York, N. Y.
*Approved as a Correspondence School Under the Laws of the State of New York*

*Another National Home Study Council*

## Photos ENLARGED

Size 16x20 inches
Same price for full length or bust form groups, landscapes, or pet animals, etc., enlargement of any part of group picture. Safe return of your original photo guaranteed.

**98c**

**SEND NO MONEY** Just mail photo or snapshot (any size) and within a week you will receive your beautiful life-like enlargement also 16x20 in., guaranteed fadeless. Pay postman 98c plus postage on arrival or $1.00 with order and we pay postage. **SPECIAL FREE OFFER** With each enlargement we will send Free a hand-tinted miniature reproduction of this picture. Take advantage of this special offer now.

**UNITED PORTRAIT COMPANY**
900 West Lake St., Dept. H-370, Chicago, Ill.

## DRAFTING

**BOOKS SENT FREE!**
ON APPROVAL

Only fifteen minutes a day with these WONDER BOOKS will prepare you for a good Drafting job in less than a year! Mechanical and Architectural Drafting from simple straight lines to important, complex plans—*a step at a time!* Built especially for beginners for men with only grammar schooling. Drafting from practice *plus engineering*. Made easy and clear!

**For Beginners**
Written so you can understand every word, by 18 famous Engineers and Architects. Deluxe flexible binding. 1750 pages, 1000 blue prints, charts and diagrams. Prepares you for a good Drafting job in mechanical or architectural lines. Sent for 10 days' free use. If you send coupon immediately.

**"Blue Print Reading"**

**"Architectural Plans."**

**Big Field—Big Demand—Big Pay!**
Competent draftsmen needed now to fill building and manufacturing lines at $50 to $100 a week. That's just the beginning—for draftsmen have the best chance for advancement! Pleasant, fascinating work, easy to learn at home in spare time with books. Send coupon for a set FREE, and see for yourself!

*A year's Consulting Membership to the American Technical Society now given free to all readers of this famous Cyclopedia of Drafting. Many say that's worth more than cost of books.*

**FREE** If you send for these great Drafting Books NOW we will include without cost a complete volume "Blueprint Reading" containing 120 pages sturdily bound in cloth, and also a complete portfolio of 38 plates covering the basic orders of architecture. These plates are drawn to scale and are very valuable

**American Technical Society**
**Dept. D-8320, 58th & Drexel Ave., Chicago**

Send for 10 days' free use, freight paid, my set of DRAFTING. In return for mailing this coupon promptly, send absolutely FREE "Blueprint Reading" (Builders' 120 pages, 60 illustrations, also a complete portfolio of 38 plates. I will pay the few cents delivery charges. If I wish I may return books in 10 days and you need send me nothing. If I prefer to keep them I will send $1.80 after 10 days, then $3.00 a month until $14.80 (special reduced price) is paid.

Name .....
Address .....
Employed by .....
Address .....


## Building a Pigmy Transmitter

*(Continued from page 125)*

use over 150 volts or B battery or eliminator power on a 199 tube. 100 to 135 volts is a safe voltage.

With the antenna, ground or counterpoise, and the B power and key connected, you are ready to transmit. Move your receiver several yards away and tune in to the wave you desire. Light the tube of transmitter and press the key. Insert the battery cell in the clips of the antenna tuner so the bulb lights. Turn the primary tuning condenser of transmitter until a whistle is heard in the receiver at the point desired. Then turn the dial on the antenna tuning condenser until the bulb brightens slightly. This indicates that the antenna system is in tune with the primary coil of the transmitter and that the antenna is radiating. By using an old cell so the bulb just glows a dull red this increase in brilliancy can be easily seen. When the proper point has been reached remove the cell from the clips and allow the antenna current to flow through the bulb filament as though it were part of the antenna itself. A sensitive wavemeter will also indicate this resonance by the indicating needle of the meter.

Go through this procedure for both the 80 and the 40 meter bands, marking on the panel and on the antenna tuner the exact points for dial settings for both bands.

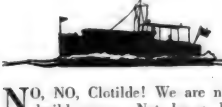
A microphone can be used by winding one turn of insulated wire on the coil tube about ¼ inch below the bottom of the primary coil and connecting it direct to the "mike" by suitable clips somewhere on the panel. Press the key and talk into the mike and the voice will carry a mile or two with fair volume and clarity. Only DC current from B batteries or eliminator can be used for this purpose.

When the transmitter and accessories are finished a cabinet should be made from the former of thin wood. Cigar box wood was used for the one in the photos and fitted snugly down over the battery clips with a hole in the top so the tube could be inspected, inserted or removed. Parts of the left side and back were cut away so the connecting clips could be reached easily.

This particular transmitter has a real kick and is more than a toy.

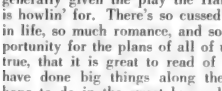
## *Andy's Shop Mail Box Column*

*(Continued from page 182)*



NO, NO, Clotilde! We are not how-to-build crazy. Not by a long shot. MODERN MECHANICS has done the unusual only in daring to publish stuff along the how-to-build line that wouldn't insult the readers' intelligence. We, say the eds to me, don't go in very heavy for lacy jig saw work, lampshade embroidery or silly tin toys. Now we aren't sayin' other books do, because we don't care. But the fact remains that two new books imitating good old double-M are about to make their appearance on the stands, and they found their inspiration in the success MODERN MECHANICS has had in publishing projects that are mature.

You know, there is quite a bit of stuff going on that is intensely interesting to just a few mortals who are interested in limited fields of endeavor. A case in point is astronomy. The men who have the bug have it bad, and I'm fascinated myself, but with space in the mag at such a terrific premium the eds have only the choice of running what they have every indication the great majority wants. Get the idea? And so it is that hot features on the major news breaks, like the Paris Gun, the Burney's Balloon, and interesting inside personal stories like Dick Grace's in this issue are generally given the play the Hangar Gang is howlin' for. There's so cussed much fun in life, so much romance, and so much opportunity for the plans of all of us to come true, that it is great to read of those who have done big things along the lines we hope to do in the sweet bye-and-bye.



Golf has a lot of fans. We've got a pippin of a spread on golf which shows how Bobby Jones exposes the real under-the-skin mechanics of golf. If you love to shoot golf, miss this not, me friends.

*(Continued on page 205)*

# *This is* FIGHTING *Talk*

**IF YOU'RE a quitter you won't read far in this advertisement. If you're not—if you have the courage to face facts—you want to know who is responsible for your not getting ahead faster. It's YOU. The man who won't be licked *can't* be licked. If you're a drifter you'll always wish for success but never do anything about it. The earth is cluttered with that kind.**

**If you're a fighter you *will* do something about it. You'll get the special training that fits you for advancement, and you'll go on to a bigger job.**

In spare time, right at home, you can get the training you need through the home-study courses of the International Correspondence Schools. Thousands of other men have lifted themselves out of the rut and into well-paid, responsible positions by I. C. S. study. Are they better men than you?

The time for action is *this minute*. Find out about this practical educational method that lets you learn while you earn. Check the subjects that interest you in the coupon below and mail it today. It doesn't obligate you in any way to ask for full particulars, but that one simple act may make all the difference between failure and success. *Do it now!*

**INTERNATIONAL CORRESPONDENCE SCHOOLS**
*"The Universal University"*
Box 2216-F, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject before which I have marked X:

**TECHNICAL AND INDUSTRIAL COURSES**

| | |
|---|---|
| ☐ Architect | ☐ Automobile Mechanic |
| ☐ Architectural Draftsman | ☐ Plumbing ☐ Steam Fitting |
| ☐ Building Estimating | ☐ Heating ☐ Ventilation |
| ☐ Wood Millworking | ☐ Sheet Metal Worker |
| ☐ Contractor and Builder | ☐ Steam Engineer |
| ☐ Structural Draftsman | ☐ Steam Electric Engineer |
| ☐ Structural Engineer | ☐ Civil Engineer |
| ☐ Electric Wiring | ☐ Surveying and Mapping |
| ☐ Electrical Engineer | ☐ Refrigeration ☐ Highway Engineer |
| ☐ Electric Lighting | ☐ R. R. Locomotives |
| ☐ Welding, Electric and Gas | ☐ R. R. Section Foreman |
| ☐ Reading Shop Blueprints | ☐ R. R. Bridge and Building Foreman |
| ☐ Telegraph Engineer | ☐ Air Brakes ☐ Train Operation |
| ☐ Telephone Work | ☐ Highway Engineering |
| ☐ Mechanical Draftsman | ☐ Chemistry ☐ Pharmacy |
| ☐ Mechanical Draftsman | ☐ Coal Mining Engineer |
| ☐ Machinist ☐ Toolmaker | ☐ Navigation ☐ Boilermaker |
| ☐ Patternmaker | ☐ Textile Overseer or Supt. |
| ☐ Pipefitter ☐ Tinsmith | ☐ Cotton Manufacturing |
| ☐ Bridge Engineer | ☐ Woolen Manufacturing |
| ☐ Bridge and Building Foreman | ☐ Agriculture ☐ Fruit Growing |
| ☐ Gas Engines ☐ Diesel Engines | ☐ Poultry Farming ☐ Radio |
| ☐ Aviation Engines | ☐ Marine Engineer |

**BUSINESS TRAINING COURSES**

| | |
|---|---|
| ☐ Business Management | ☐ Business Correspondence |
| ☐ Office Management | ☐ Lettering Show Cards ☐ Signs |
| ☐ Industrial Management | ☐ Stenography and Typing |
| ☐ Personnel Management | ☐ Complete Commercial |
| ☐ Traffic Management | ☐ Civil Service ☐ Mail Carrier |
| ☐ Accountancy ☐ Cost Accountant | ☐ Railway Mail Clerk |
| ☐ C. P. Accountant | ☐ Grade School Subjects |
| ☐ Bookkeeping | ☐ High School Subjects |
| ☐ Secretarial Work | ☐ College Preparatory |
| ☐ Spanish ☐ French | ☐ Illustrating ☐ Cartooning |
| ☐ Salesmanship ☐ Advertising | ☐ Lumber Dealer |

Name .....

Address .....

City ..... State .....

Occupation .....

*If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada*

See the Craters in the MOON!

Astronomical and Terrestrial TELESCOPE
Magnifies 30 Times
Own a genuine Astronomer's Telescope. See thousands of miles away. Make sun, moon, planets, even your next-door neighbors, Moon Craters, Sun Spots, Eclipses, Comets enlarged 30 times. Strange thrills!

Price Only $3.95

Hours of fun looking at scenery, games, bathing beauties. Great for trips and voyages. Made like telescopes used in observatories. Guiding wrote, "Moon seemed 10 yards away."

See Landscapes, Games, Ocean Scenes Enlarged 30 Times!

Diameter 2 inches. Speci. friction adjustment for focusing. Adjustable bracket and clamp can be fastened to chair, fence, branch, etc. Finest materials. Will last lifetime.

Five Days Free Trial
Rush only $1.00 now. Pay balance ($2.95 plus postage) when postman delivers. Keep 5 days. If not delighted, return telescope and money will be refunded.

EARN $10 A DAY
Charge 25c to look at the moon

ROLLO SPECIALTY CO.
Dept. H-355
220 E. 3rd St., Cincinnati, O.

New Kind Of Can Opener

Works Like Magic!

At last! An automatic, simple little can opening machine for the home. This revolutionary invention in only a few short months has banished old can openers from over 100,000 kitchens. And no wonder! Imagine an amazing lifetime device that holds the can and—not the top edge—cuts it with slick, smooth, safe cleanness. Just turn a crank, that's all! Approved by Good Housekeeping Inst., Modern Priscilla, etc. Write today for special introductory advertising offer.

Central States Mfg. Co., Dept. H-2203
4500 Mary Ave., St. Louis, Mo.

AGENTS
Men and Women make up to $6 and $8 in an hour, full or spare time. Big, exclusive territories. Write quick for Sales Outfit and Territories. Send quick for FREE TRIAL Offer.

Anyone CAN LEARN

No talent or experience necessary. Fascinating work. Pays big money. Complete instruction book tells about Alphabets, Colors, How to Mix Paints, Show Cards, Window Board and Wall Signs, Ready made letters, Gilding, Tricks of the Trade, also gives 100 Alphabets and Designs. Book bound in flexible oil cloth, gold edges, and four ball bearing Show Card Pens. Sent postpaid $3.00, C. O. D. 10c extra.

Artists Pub. Co., 57 West St. Dept 3, N. Y. City

$3

EARN MONEY IMMEDIATELY—
WE FURNISH EQUIPMENT TO START!

RUPTURE

Appliance Praised by Athletes

Scores of ruptured runners, athletes, golfers and sportsmen wear the Brooks majestic-measure sanitary, automatic air cushion appliance for its lightness and superior comfort. Holds rupture correctly with a firm, gentle support that does not interfere with body freedom. Over 3,000,000 Brooks appliances sold. A vast improvement over old-style devices. Wear one 10 days on trial. Don't suffer all your life. Investigate. Free 28-page Rupture Booklet sent in plain sealed envelope.

BROOKS APPLIANCE CO.
146-B State Street Marshall, Mich.


## Outdoor Motor Car Does 40 m.p.h.

*(Continued from page 146)*

the face of the pulleys on the transmission shaft.

The transmission assembly is supported to the frame in shaft hangers, as shown in a detail. These hangers are made of maple, bushed and reinforced with ⅛″ steel plates. Their construction is obvious.

A friction drive wheel replaces the propeller on the propeller drive shaft of the outboard motor. The exact design of this wheel will vary with different makes of motors. A very satisfactory way to make the wheel is to obtain a broken and discarded propeller from a marine supply store, and turn this down to a cylinder with a flange and a small pulley for the pump drive belt. A steel washer 2½″ in diameter is fitted against the flange, then a group of rubber disks are slipped over the hub and built up to about 1¼″ thick. These are held securely by another washer and pressed firmly in place with the propeller shaft nut.

Most outboard motors depend upon their movement through the water to maintain water circulation around the cylinders. When used for other purposes, mechanical circulation must be established. This can be done in a number of ways. The method shown in the sketch is one of the simplest. A small gear-type pump is mounted to screws on the drive-shaft housing, and is driven by a ⅛″ round belt from a pulley turned on the rebuilt propeller hub. These pumps can be had at an auto junk-yard. A number of old cars used gear pumps to maintain oil circulation.

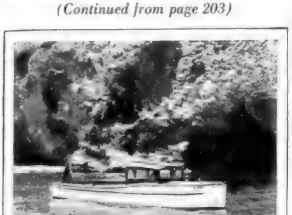
If one has an old outboard motor, the rest of the cycle-car can be built up cheaply by a good shopper at auto junk-yards. Studying the drawings will give the prospective builder a clear idea of the fundamental construction. A speed as high as 40 m.p.h. can be had on the level in high with a 2 to 3 h.p. motor.


TOBACCO
Habit Overcome Or No Pay

Over 500,000 men and women used Superba Remedy to help stop Cigarettes, Cigars, Pipe, Chewing or Snuff. Write for full treatment on trial. Contains no dope or habit forming drugs. Costs $2.00 if successful, nothing if not. SUPERBA CO. A-10, Baltimore, Md.

## *Andy Says Boats Are Popular Now*

*(Continued from page 203)*



Here is Walter Collinge's fine little deep sea runabout, shown anchored off a balmy California beach. Sweet, eh?

Boats are deservedly a popular subject for a mag like MODERN MECHANICS. The little cruiser *Allegra* is quietly being built in at least seven places we know of, and the call of the water is responsible for the unusual interest manifested in boats at this time of year. One of the boating friends of the magazine wrote an editor the other day, and you can see by his letter something of the fascination the water has for red blooded sons o' sea cooks. This particular letter is from Walt Collinge, out Californy way, and Collinge, being a profesh photographer, sent a shot of his little water wagon which I'm running above. Thanks for the buzz, Walt:

Dear Sir:

Your letter came in the other day and I think I will drop you another line. The point I wanted to drive home was that the small boat man who lives on rough open water gets very little attention from the yachting magazines. Auxiliaries of small size were at one time almost unknown so far as I could find out.

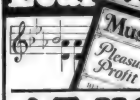
Since then Sam Rabl in Fore An' Aft gave us "Peggy," a very simple little hooker, yet it seems large enough for two. Chester Nedwidek also got one out but not quite so good looking, this for Motor Boating. Both are to use outboard power, which is not so good for open water. Then there have been some charming little packets by other well known designers, but the price is high and no amateur could build them.

You speak of doing something in this line and sending it on to some yachting magazine. The big yachting magazines dearly love the little boatman ('s money) and they might run it but I am not so sure. But right here in Modern Mechanics you have a good magazine—why not add a small boat department each month helping the small boat man with simple, safe designed boats, not yachts? These can all be under 25 feet—that's about long enough—some sail, some power, and some auxiliaries.

I suppose you know how the yachting magazines knock the auto motor in boats. Of course they do

*(Continued on page 206)*


**Learn Music AT HOME!**




Let us tell you how you can quickly and easily learn to play your favorite instrument, right in your own home and in your spare time. Music will make you popular, welcomed everywhere, and offer many big-money opportunities.

**Easy as A-B-C**

You need know nothing about music to begin. We give you personal, individual instruction right from the start and guarantee your satisfaction. You will be surprised and delighted that music can be made so easy and fascinating.

Courses in Piano, Violin, Voice, Trumpet, Mandolin, Organ, Banjo, Tenor Banjo, Spanish Guitar, Hawaiian Guitar. Surprisingly low cost; easy terms.

**Send for Our New Catalog Today**

It will tell you all about this great School—now in its 26th successful year—and the wonderful National Academy Method that has meant success to over 200,000 enthusiastic students. Send for it right now, while you think of it. It is FREE.

**NATIONAL ACADEMY OF MUSIC**
Dept. 335 702 East 41st Street, Chicago

**Make Money in Photography!**

We train you quickly at home. No experience necessary. Spare time or full time. Photographs in big demand by magazines, newspapers, advertisers, etc. Portrait Photographers make more money today than ever before. Commercial Photography also pays big money. New plan. Nothing else like it. Write today for details and new FREE book, *Opportunities in Modern Photography*.

**American School of Photography**
Dept. 205-B 3601 Michigan Ave., Chicago, Ill.

**ENGINEERING—ELECTRICITY ARCHITECTURE—DRAFTING**

Save time—enroll at this old established school of engineering. Enter any time, days or evenings. 1, 2 and 3 year courses. Diplomas and B. S. Degrees. Special 4 months' practical course in Drafting. Other short courses. Low tuition —easy terms. Earn while you learn. Free employment bureau. Athletics. Successful graduates everywhere. Write for our free, illustrated 80 page "Blue Book." It gives you all the facts. Address the President, Charles W. Morey, B. S., M. E.

**CHICAGO TECHNICAL COLLEGE**
Dept. H-43. 118 East 26th Street, Chicago, Ill.


Do you like to build things? Turn to page 201 and read about a big new book for home craftsmen.

## 34 Lesson Drawing Course $2.98

**The biggest value you ever saw advertised anywhere**

Haven't you often wished that you could draw cartoons. Illustrate some idea, sketch some pretty face, etc. You can do all of these things. One of America's most famous Cartoonists and Illustrators has developed a great, simple system for success in all branches of Commercial Art. This system has revolutionized the entire theory of drawing. It means that drawing can be as easy for you as writing—much simpler than learning shorthand, bookkeeping or typewriting. We are now placing this original system for learning Drawing, Art and Cartooning consisting of 34 lessons with over 500 illustrations within reach of every one. If you will devote a few hours each week to the Course WE ABSOLUTELY GUARANTEE that you will learn to draw and draw well before you have half finished the Course. If we fail to make this claim good, we will refund every cent paid us. By eliminating a large office force for answering correspondence, expensive catalogs, etc., we are enabled to make a price of $2.98, the cheapest price ever known for a high-grade home study course. Learn to draw. It is a big asset, no matter what field you are in.

## SEND NO MONEY

Just order the course and $2.98 on arrival pay postman plus a few cents postage, payment in full for the entire Course and Drawing Outfit. If not entirely satisfied, return within ten days and we will send Refund Money. Address

If you order the Course at once, we will include a drawing outfit, consisting of artists' pencils, pens, paper, erasers, thumb tacks, etc., enabling you to go to work without any additional cost.

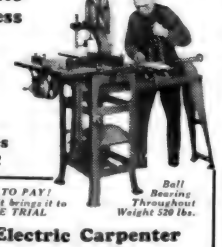
LEDERER SCHOOL of DRAWING
Dept. 576-W Chattanooga, Tenn.

Orders from outside the U. S. A. are payable $3.24 cash with order.

## SENT ON REQUEST

Helpful discussion of this important problem and of fascinating opportunities in Mechanical Trades is contained in our booklet, "Choosing a Trade." Sent free on request. Write for Bulletin 62.

BODEE INSTITUTE
1715 Broadway, New York
1305 N. Broad St., Philadelphia
85 Court St., Brooklyn



## Get Into Business this Easy Way

## 7 Machines in One!

*A YEAR TO PAY! Small deposit brings it to you for FREE TRIAL*

*Ball Bearing Throughout Weight 320 lbs.*

## The Electric Carpenter

**Runs From Any Light Socket**

Make money on screens, trellises, furniture, toys, etc. 8" Circular Saw; 11" Band Saw; 26" Lathe, 10" swing; 6" Jointer; Reciprocating Sharper; ¾" Hollow Chisel Mortiser; Sander. Does 35 woodworking operations. NOT a toy.

*Write Today for Illustrated Folder*

THE WOODWORKING MACHINERY CO., INC.
259 N. Eleventh St. Philadelphia, Pa.

We also build a complete line of single-purpose machines.


# *Andy's Shop Mail Box Column*

*(Continued from page 205)*

**This pint sized cabin plane was built by an M-M daddy for his son. It has a Maytag washing machine engine.**

or the advertising marine (genuine) motor builders would withdraw their advertising.

However, good automobile motors will and do work in boats. I know of some that have been on the job now for up to eight or more years pushing good sized boats 30 feet and over and there are a great many 20-foot boats with auto motors out here.

I do not say they are as good as marine motors, but for the man with a few hundred dollars and some tools which he knows how to use, a well rebuilt and converted auto motor will give him several years of good service, I know. I am going to put my boat overboard next week for the eight season with a Dodge auto motor in it. The first three years it was just an auto motor, then I converted it with auto engine parts so I suppose it's a marine (not genuine) motor now. Power Boating roasted me one time about a year ago for saying they would work and just a short time ago came out with a statement that auto engines in boats never were very far out—is that so? Well, mine has covered around 6,000 miles and has been forty miles off shore and 180 miles from her home port.

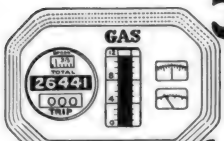
And it cost me all converted $180.00 and has never given any trouble whatever. Two years ago my son and I went to the Regatta at Long Beach, 90 miles southeast of here and covered 700 miles in eight days, making the run down and back in thick fog all the way and mostly at night without seeing anything but some steamers, some a little too close aboard for comfort, and in that time we never opened the tool box.

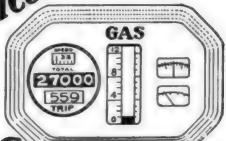
We burned 180 gallons of gasoline and we make 5 miles to the gallon at slow speed. We started out early each day and got in late, not only following the sailing races but running off shore and about the harbor.

I think the new Columbia and other inboard-outboard drives will work out with auto motors. I designed one some three years ago and sent it to Motor Boat, I think. They said it would work but would be expensive. Small boats should have their

*(Continued on page 208)*

# Over the Mountains from Los Angeles 559 Miles on 11 Gallons of GAS




*Think of it!* FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. That is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

# THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

**Whirlwind users, reporting the results of their tests, are amazed at the results they are getting.** Letters keep streaming into the office telling of mileages all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25% to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. P. Goerzen writes: "I made an actual test both with and without a Whirlwind, getting 13⅓ miles without and 31 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to the gallon and 25% in speed. We placed another on a Willys-Knight and increased from 12 to 17 miles per gallon."

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I have saved in gasoline these last few years has brought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste? Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

### FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

### SALESMEN AND DISTRIBUTORS WANTED

**Free Sample and $100.00 a Week Offer**

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer and full particulars sent on request. Just check the coupon.

WHIRLWIND MANUFACTURING CO.
999—284-A, Third Street Milwaukee, Wis.

### GUARANTEE

**No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.**

### FREE TRIAL COUPON

WHIRLWIND MANUFACTURING CO.
999-284-A Third Street, Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carburetine device and free trial offer. This does not obligate me in any way whatever.

Name .....

Address .....

City .....

County ..... State .....

☐ Check here if you are interested in full or part time salesmen's position

# MOULDING A MIGHTY ARM

## Get a 17 Inch Bicep

Complete Course on Arm Building

## ONLY 25c

Get an arm of might with the power and grip to obey your physical desires. Within 30 days you can now build your arm from a scrawny piece of skin and bone to one of huge muscular size. I don't mean just a 17-inch bicep but a 15-inch forearm and an 8-inch wrist. This specially prepared course will build every muscle in the arm because it has been scientifically worked out for that purpose. You can develop a pair of triceps shaped like a horseshoe and just as strong, and a pair of biceps that will show their double head formation. The sinewy cables between the biceps and elbow will be deep and thick with wire cable ligaments. In that arm of yours, the forearm will belly with bulk, and the great supinator lifting muscle you can make into a column of power, while your wrist will grow alive and writhe with sturdy sinew. All this you can get for 25 cents—send for this course today and within 30 days' time you can have a he-man's arm built to be as beautiful, brawny and magnificent as the village blacksmith's.

You can't make a mistake. The guarantee of the strongest armed man in the world stands behind this course. I give you all the secrets of strength illustrated and explained as you like it. 30 days will give you an unbreakable grip of steel and a Herculean arm. Mail your order now while you can still get this course at my introductory price of only 25c.

### RUSH THE COUPON TODAY

To each purchaser will be given a FREE COPY of *THE THRILL OF BEING STRONG*. It is a priceless book to the strength fan and muscle builder. Full of pictures of marvelous bodied men who tell you decisively how you can build symmetry and strength the equal of theirs.

**REACH OUT—GRASP THIS SPECIAL OFFER**

**JOWETT INSTITUTE of PHYSICAL CULTURE**

**422 Poplar Street, Dept. 37-G, Scranton, Penna.**

Dear Mr. Jowett: I am enclosing 25c. Please send me the course "MOULDING A MIGHTY ARM" and a free copy of "THE THRILL OF BEING STRONG."

*Name*_____

*Address*_____


## *Letters From the Shop Mail Box*

*(Continued from page 206)*

motors aft, so in designing such boats why not make them for either the big outboard motors or if the builder so desires he can install an auto engine, or a marine engine with the inboard-outboard drive.

I believe the next issue of The Rudder will have the first of such designs. There are a whole fleet of these boats coming out now all around $1,000.00 —very nice if you want to spend that much, but I can build one that will run just as well and look good too for less than half that, quite a little less than half. My own boat was built in the back yard and while Billy Hand designed the hull I did the cabin and installed the motor and she is as completely equipped as the best of them; full electric equipment including automatic gas and bilge pumps and full lighting equipment, and we can make up a berth for two which we use every now and then.

Well, I have said my little piece. I am going to have a new boat next spring but will have it built. Business has been good and so I can get a better boat and will not have to bother hunting one I can build in the back yard. Still, my daughter wants a boat and I may build "Peggy." Son is away at college and a midshipman U.S.N.R. Naval Science and Marine Engineering is interesting him. He won some silverware before leaving for college; can give a good account of himself with a Star sloop against the best men we have out here: 7th out of a fleet of California's twenty best boats for a five day series, with two days practice after getting home from school is not so bad.

I see you are having snow back there—my daughter came home last night with her hair wet: "Say Dad, you are missing a lot of fun by not coming down to the beach in the afternoon; swimming is fine." Well, Dad will be there next week after seeing the Boat Show at Los Angeles Saturday.

Very truly yours,
J. WALTER COLLINGE.

This prompts me to call your attention to the fact that Billy Atkin is doing a small auxiliary just such as Mr. Collinge is askin' for. You can cook up the boat, build a radio for her like L. B. Robbins is describing in this vere issue of Modish Mekaniks, and equip her from stem to stern with ideas the book gathers and publishes for the edification and delight of all people who believe in the terrible seriousness of doing things for fun.

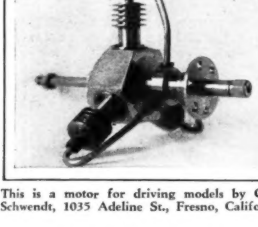
We've got a lot of whiz-bangs on that Paris Gun story. Everybody seemed to be interested. All that news sheets seemed to have carried up to the time of our publishing of the Paris Gun with its intimate details was a shot or two showing the gun in the woods, and that's all. We've referred classes in military science to Col. Miller's yarn, and no end of comment has come our way on that scoop. She was a lulu, and man alive, think of a gun so big that the forces pent up in that little eight-inch barrel equalled the strength of three Niagaras instantan-

*(Continued on page 209)*

## *More Shop Comment by Andy*

*(Continued from page 208)*

eously harnessed. A single cylinder internal combustion engine—which is really what a gun is, after all—of 9,000,000 h.p. is some engine, says me!



**This is a motor for driving models by Oscar Schwendt, 1035 Adeline St., Fresno, California.**

A recent poll of the manual training departments and physical science departments of four high schools in the city of Minneapolis, which has over a half million population and is therefore thoroughly cosmopolitan and representative of a cross section of what the up-and-coming element in our population thinks about, showed that it was universally conceded that the American school of light airplane building was uppermost in the minds of mechanically inclined students. Further, the efforts of Ed Heath, Bud Snyder, Ivan Driggs, Dwight Huntington and Pete Pietenpol were considered to be on the first line of progress.

Weston Farmer, Stewart Rouse and Douglas Rolfe are considered, it was shown, the most popular and best informed authors on light airplane subjects. Anything these men write is read avidly. Farmer's work particularly on either boats or planes is considered highly informative and valuable. Orville Hickman also rates highly, as does Gene Shank—all favorites.

* * *

Funny they never said anything about Aady. I figgered I was on the map big. Oh, well. Run a colyumn if you want the world to forget you.

* * *

I've made more friends since I've been running this column than I ever had in my life before. And they are not postage stamp friends, either, Doc. They're the kind that would take off their shirt to do you a good turn. That's why I like this magazine. The fellows who read it are all that way. it seems to me.

* * *

Always mighty glad to get your notes and ideas, boys. Never too busy to give 'em a personal answer even if I can't publish 'em. Y'see if the letters are short, according to the recent edict, I can run 'em. Otherwise nix. And what a bunch of 'em I have on the spindle!


**STEINER COMBINATION WOODWORKER $45.00**

Belt Sander, Saw, Grinder, Drill

Has ¼ H. P. GE Motor, switch, cord and plug. 3x24 in. sander, 6-in. adjustable saw, 5x8 in. grinder for any tool or drill.

Takes up to ¼ in. drills. Operates many other tools. Bronze bearings, endless belt, polished table. Size 20x20. Weight 60 lbs. Highest grade—lowest price. Satisfaction guaranteed. Order now or write for circular M M.

Pats. Pend.

**STEINER-FULTON PROD. CORP.**

5751 Easton Ave. St. Louis, Mo.

**BASHFUL?**

"Shame on you!" Are you nervous, embarrassed in company of the other sex? Stop being shy of strangers. Conquer the terrible fear of your superiors. Be cheerful and confident of your future! Your faults easily overcome so you can enjoy life to the fullest. Send 25c for this amazing book.

RICHARD BLACKSTONE, B-237 FLATIRON BLDG., NEW YORK

**Amazing New Oil Burner!**

**Revolutionizes Fuel Costs**

**PLUGS IN YOUR LIGHTSOCKET**

Now you can do it. Get AUTOMATIC OIL HEAT at AMAZING LOW COST. Sensational new burner—EASY to INSTALL as a radio—so inexpensive every home can afford it. Plugs in your lightsocket. FITS EVERY STOVE OR FURNACE—Hot water, air, steam, or vapor system. Only a few simple adjustments. Nothing to get out of order. Anybody can put it in. No complicated wiring, ignitions, oil pumps, etc. Burns OIL AND AIR the new way, with patented indestructible mineral (crystal) wick. Uses all the oil. No waste. Cuts Fuel Bills. No smoke, soot, or grease.

**SAFE TO OPERATE**

Siphonic Constant Level Valve safeproofs GRISWOLD against mistakes in operation—banishes housewife's fear of putting it out of order. CAN'T OVERFLOW OR FLOOD. Operates partially efficient even when electric power fails. QUIET. Complies with all ordinances.

**GUARANTEED**

FULLY AUTOMATIC Room temperature control. GUARANTEED. Get complete details now. Wide awake dealers and men with small capital to invest, send for MONEY-MAKING FRANCHISE. Easily worth $10,000 to $50,000 annually to right party. SPECIAL OFFER for promptness. Act today. Now!

**GRISWOLD OIL BURNER CO.**
2008 N. Union St. Griswold, Iowa
U. S. A.

**Write for Special Dealer OFFER**

# 10,000 Chest Expanders ONLY 99¢ EACH!

These are genuine heavy cabled progressive exercisers of powerful tension and resistance. Each cable contains 50 pure rubber strands, and is fully guaranteed. Never before in the history of physical culture have these exercisers been offered at such a low figure.

It is done now only because we are getting out our new line.

## Less Than the Price of a Meal!

If you buy elsewhere you will pay more than twice as much, and perhaps five times as much. Don't forget that we are direct manufacturers, and if it weren't for this Special Summer Offer, you would never have the opportunity to make the best buy you ever made. Just think of it! A genuine guaranteed 5 cable 50 strand para rubber cable exerciser for only 99c! Less than the price of a good meal! We also have a few 10 cable progressive exercisers on hand at $1.85.

**FIRST COME, FIRST SERVED**

Order your exerciser now, before it is too late! This offer is good for a limited time only. After that you will have to pay a great deal more. Get this wonderful health-builder that should be in every home.

It only takes a minute. Just sit down, clip the coupon, write your name and address on it, and mail it to our address.

**Buy 2 or 3** at this unheard of price. I'm one yourself and one or two more for gifts to friends. This is a real opportunity!

**DEALERS ATTENTION!**

Here's your chance to purchase a supply of honest-to-goodness guaranteed progressive exercisers at a price far below normal. You can resell them to your store customers for as high as $8 for the 10 cable exerciser. Order a sample of each model to try out and test to your satisfaction, then order any number you desire. No order is too large or too small. Here's a buy at a price you never thought possible.

**COMPLETE INSTRUCTIONS**

Complete instructions for scientific body-building are given away absolutely free with each exerciser. With these you will find it a simple thing to develop your strength and grow healthy.

**SEND NO MONEY**

Just pay the postman for the exerciser when it is delivered to you, plus a few cents postage.

**PROGRESSIVE EXERCISER CO.,**
**Langdon Building, Dept. 1667, B'way & Dunn St., New York City**

Gentlemen: Please send me your [ ] 5 cable guaranteed @ 99c [ ] 10 cable exerciser @ $1.85

(Check the one you want.) It is understood that I am to get your instructions for using absolutely free. If I am not satisfied, I can return the exerciser within five days and you will return my money.

Name ..... Age.....

Street .....

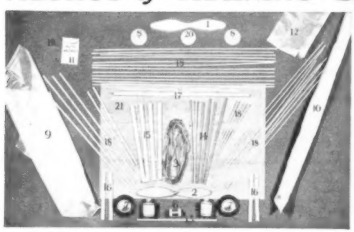
City and State .....

**JUST CLIP THIS COUPON**

# New Quick Way to Get Into AVIATION

*Major Rockwell*
**Who Will Train You at Home**

## *Major Rockwell's* PRACTICAL METHOD *of* TRAINING ~ *Learn by Doing*



This three-foot flying model, with all parts and fittings, is sent to you as a working outfit to build your own plane. When assembled it will fly by its own power. By using this model, as you go through your lessons, you will be able to grasp, easily and quickly the fundamental principles so necessary to success in Aviation.

### Jobs Open for Trained Men
### Up To $150 Weekly

Trained airmen are needed in this great new industry. Mechanics, Assemblers, Motor Experts, Riggers, Designers, Airport Managers are scarce and command big money—$50 to $150 weekly. Become a trained aviation man and step into one of these profitable big pay jobs. To date over 500,000 new jobs have been created by the amazing growth and popularity of Aviation. This new giant industry is expanding faster than the supply of available trained men.

## Learn at Home in Only 12 Weeks

Don't leave home. Don't give up your present job, but keep right on earning money and in your spare time prepare yourself for a big aviation job. My Home Study Course, combined with this model airplane for experimenting, teaches you all about construction, rigging, air resistance, motors, instruments, the theory of flight, air navigation—everything you should know to qualify for any branch of Aviation at big pay.

Major Rockwell will train you until you have an Aviation job paying $200 to $400 a month.

### No Advanced Education Necessary

You don't need to have a high school education or know anything about mechanics to master my course. My easy-to-understand lessons and this model airplane will enable you to grasp every point, every principle easily and quickly. I give you all the knowledge necessary to pass the government's examination for either mechanic or pilot.

### Satisfaction or Money Back

You take no risk. Your training with me is under a positive money-back agreement. I am so sure that I say, if my training has not helped you, after you have finished, you get every penny of your tuition refunded. Act now. Take the first step into this thrilling new industry by returning the coupon for a copy of my famous book that explains everything in detail.

**Major R. L. ROCKWELL,**
**The DAYTON SCHOOL of AVIATION**
**Desk G-2 Dayton, Ohio**

## *Mail Coupon for* BIG FREE Book

**Major R. L. Rockwell,**
**The Dayton School of Aviation,**
**Desk G-2, Dayton, O.**

Dear Major: Please send me your FREE book on AVIATION AND YOUR REMARKABLE TUITION OFFER. I AM NOT OBLIGATED.

Name .....

Address .....

Town ..... State ..... Age .....

# SAY FELLOWS — LEARN ELECTRICITY.

Let me tell you in my big FREE book how I can quickly train you RIGHT HERE IN MY GREAT SHOPS for jobs leading to salaries of $60.00 to $200.00 a week. NOT BY CORRESPONDENCE. NOT BY BOOKS: you learn by doing, on real electrical machinery in 90 DAYS. You don't need advanced education or electrical experience. EARN WHILE LEARNING. Free employment service for life when you graduate. Clip the coupon TODAY, fill it in and mail it for my BIG FREE BOOK. It tells you the whole story.

Sincerely
H. C. Lewis

**COYNE**
**ELECTRICAL SCHOOL**
H. C. LEWIS, Pres., Dept. BO-53 Est. 1899
**500 So. Paulina St., Chicago**

**FILL OUT - MAIL TODAY!**

**H. C. LEWIS, Pres.**
**COYNE ELECTRICAL SCHOOL, Dept. BO-53**
**500 S. Paulina St., Chicago, Ill.**
Dear Mr. Lewis: Please send me your Free Book.

*Name* .....
*Address* .....
*City* ..... *State* .....

FARNHAM'S MINNEAPOLIS